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INDEX TO CONTENTS, PAGE 353 - - - - - - - ADVERTISERS' INDEX, PAGE 22.

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SMITHSONIAN DEPOSIT

Riter-Conley Manufacturing Company

STEEL CONSTRUCTION

Pittsburgh

THE UNITED GAS IMPROVEMENT COMPANY,

PHILADELPHIA.

—•—

BUILDERS OF

THE STANDARD DOUBLE SUPERHEATER

LOWE WATER GAS APPARATUS.

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ACCURATE MEASUREMENT

OF

AIR AND STEAM SUPPLY

(PATENTED),

AFFORDING { PERFECT CONTROL OF GENERATOR FIRE CONDITIONS.

PRODUCING { UNIFORM RESULTS. HIGHEST EFFICIENCIES.

THE AMERICAN
GAS LIGHT JOURNAL
INC.

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CONTENTS.

An Asterisk (*) Denotes an Illustrated Article.

Equitable Gas Rates, by S. E. De Frese. 353
Office Practice, by Mr. L. L. Cadwallader 355
*Subaqueous Concrete Construction, by J. E. Holdcroft 356
*English Radiant-Fuel Heating Stoves, by Mr. F.W. Goodenough. 357

EDITORIALS—
Tenth Annual Meeting, Iowa District Gas Association—[Special Editorial Correspondence, by Telegraph]. 360
Briefly Told 360
Programme of Mid-Year Conference, National Commercial Gas Association—Degree of Master of Science to Dr. Elliott and to Mr. Dunn—The Meter Generally Right—Appreciation of Mr. Gribbel's Gift—Greatest Coke Production—Municipal Plants Don't Get New Business—Intoxicants and Accidents—Protection and Reclamation—The Societe Technique-American Gas Institute Committee on Accident Prevention—English Increase in Make and Consumers.
Tar, by Mr. Alfred Hausen 362
Corrosion of Metals 365

NEW METHODS AND APPLIANCES 366
By-Products of the Mantle Industry—Smoke Prevention by Steam Jets.

ITEMS OF INTEREST FROM VARIOUS LOCALITIES 366
Montreal Company Authorized to Cross Railway Property—Gas Machinery Company Contract—Personal—Rates in Queens Borough New York—From Bath, N. Y.—Tax Payers Want the Lights—Winston-Salem Changes—New Southern Company—Large Main for Baltimore—Projected Building in Boulder, Col.—New Plant at Middletown, N. Y.—Plant to be Sold under Foreclosure—Hibbins, Mich., to Get Plant—New Castle, Del., Plant Closed—Look-out for the Dog—Mr. Printz, Vice-President—Antigo, Wis., Reorganization—Rates at Hagerstown, Md.—Philadelphia High Pressure Lighting Test—And Other Items.
Recent Patent Issues 367

UTILITIES COMMISSION NEWS 368
Bucyrus (O.) Rate Valuation—Asks Illinois Commission to Increase Minimum—Atlanta (Ga.) to Petition—Connersville (Ind.) Wants Artificial Gas at Same Price—Kingston (N. Y.) Complaint Withdrawn—Fighting the Illinois Commission.
Financial Notes 368
Public Lighting Table for June, 1914.....(Advertising Section) 10
Meeting Times of the Various Gas Associations " 27

Equitable Gas Rates.

[Prepared for Southern Gas Association, Mobile, Ala , by S. E. DE FRESE.]

This subject involves the rate at which gas may be profitably sold by the company with the greatest advantage and economy to the consumer. One of the most important things to be considered in determining gas rates is the cost of manufacture. Progressive methods demand that we keep the standard of our plants high, that the efficiency of our operating department be not impaired by carelessness or neglect or by the use of antiquated methods. Economy of operation is the most important factor in determining gas rates. The gas manager should realize this and avail himself of the newer methods and improved devices to reduce the cost of manufacture and distribution. Not infrequently we find companies merging their purchases under blanket contracts in order to secure the maximum purchasing power of their money; and in the larger companies a purchasing department under the supervision of a skilled buyer, all to the end of lower costs and that each dollar may be wisely and judiciously spent. Cost is indeed very important to a gas company, and while so important to the company should it not be of equal importance to the purchaser of gas that he too secure for his money, the greatest possible return? The matter of equitable gas rates should not be overlooked or disregarded for frequently such disregard ends in the establishing by the courts of unreasonable rates. It is the opinion of the writer that the companies should take the initiative in establishing just rates and not wait until a demand is made or the people are forced to appeal to the courts. The company should be the guardian of the public to the extent of giving it adequate return for its money. The quasi public nature of its business makes the public its charge, and the degree of confidence the public has in its public service corporations depends entirely on the consideration they receive from the corporations. Surely there is no better way of establishing that confidence than in a voluntary reduction of rates to the deserving consumer without his request or demand. We speak of the deserving consumer, meaning the consumer who is restricted from using his full requirements of gas by reason of the rate. Let us assume we are selling gas in a city where only straight line rates prevail; rates that have been established perhaps when the company secured its franchise, and were probably adopted by reason of comparison with some other city, and without any regard as to whether they were the proper rates for this city or not. Say that "A" buys 1,000 cubic feet of gas during the month for which he pays $1.35 gross or $1.25 net, the rate being $1.35 with 10 cents per 1,000 discount for prompt payment. "B" buys 20,000 cubic feet and pays $25 for it, taking advantage of the 10 cents discount, and if he had used 50,000 cubic feet he would have paid $62.50, because straight line rates offer no reduction for quanity used. In serving "A" we may have lost money, but "B" has not only paid this back to us by his purchase, but in addition to this has given us sufficient profit to cover losses on consumers of less amounts like "A." This sort of arrangement might exist and be satisfactory to the company, but "B" stops using gas because it costs too much and there is no reduction no matter what quantity he uses.

Suppose, for example, we place ourselves in a similar position. We are asking for prices on a year's supply of coal, say 20,000 tons. Would we be satisfied to accept the price offered a dealer who buys only 1,000 tons a year, and when it is most convenient for him to use it? We would think it a very peculiar concern who had no consideration for the volume of the business offered, and yet this is exactly the way we treat "A" and "B."

I shall not describe the establishing of initiative rates for new companies. In such cases there are difficult conditions to meet. The question of capital invested, taxes, interest charges, losses of all kinds, casualty and legal expense, depreciation and reserves, and all the items which go to make up our overhead expense. My purpose is to describe the proper rate for an established business, a company that has been in business long enough to know what rates it should maintain.

There are a few things we must first consider. We all realize that a 25 or 50 cent. minimum bill is too small. In most cities where such rates exist it is by reason of city ordinance and to change such regulations would be difficult. Again, where the maximum price of gas is fixed by the franchise it is equally difficult to change, hence we must apply ourselves to the discussion of rates that will insure relief without interference with our maximum rate or our minimum charge. So, as far as I can see, it is of no consequence to us that a customer

who buys only 250 cubic feet a month pays at the rate of $10 per thousand cubic feet, if we are powerless to establish such rates. True, the knowledge is helpful to a company starting in business, but with the old established companies it seems to me a problem of leaving the maximum and minimum alone and establish rates which will encourage large consumers. In other words, to make a rate which will get the big business and hold it. This done, we will have fortified ourselves against a possible reduction in our maximum rate which is generally, in my opinion, low enough.

Another point worth attention is that of giving all consumers the opportunity to lower their rates by increased consumption, and the companies greater revenue through such increased consumption; and the adoption of true business principal of large sales and small unit profits, a policy which gives the greatest possible service to the public. On the other hand, a reduction in the maximum rate, while it tends to benefit all the consumers, in reality benefits those who least deserve it, and hinders the company from establishing rates in accordance with the true principal of business.

Our experience in Chattanooga has convinced us that a rate based on monthly consumption is to the best advantage of both consumer and company. In making this rate we have so arranged it that our smallest consumer may take advantage of it if they so desire. The rate is so flexible that if the consumer uses over 10,000 cubic feet of gas a month he will enjoy the benefit of a reduction. Our rates are as follows: Maximum regular rate, $1.10 per 1,000 cubic feet, $1 net; minimum, 25 cents per month, for which we allow 250 cubic feet of gas. Our readiness-to-serve rate (illuminating) under contract is as follows:

"The Company will supply gas only through its own meters. If a meter fails to register correctly, the quantity shall be estimated by the amount registered by another meter set in lieu thereof, or by the amount registered during the corresponding period of the preceding year, as the company elect. Subscriber will protect the meter and pipes and insure the company against loss of meter or injury thereto, and will, on demand, deposit with the company such sums of money as the company may require, as security for the performance of this contract. Should the subscriber detect a gas leak in or about the premises occupied, he will immediately notify the Company and will see that no light is taken near the escaping gas, and that the gas be shut off at the service or meter cock. The Company will not be responsible for damage or loss caused by escaping gas. The Company's agents are to have access to the meter and pipe at all reasonable times to inspect them, read meter, or to stop the supply of gas for non-payment of any account whatsoever due the Company. The meter, meter connections and all pipes placed in said premises, by or at the expense of the Company, or its predecessors, shall belong to and be removed only by said Campany, its successors or assigns. Subscriber agrees to pay the Company a monthly readiness-to-serve charge of 50 cents for each 50 cubic feet per hour of the meter capacity or fraction thereof, necessary to supply his maximum demand for the year. Said meter capacity to be figured on the rated capacity of each meter at 3 inches of water pressure at inlet, with a differential of ½ inch of water pressure. It is estimated that the maximum demand of the subscriber under this application will be —— cubic feet per hour, and the subscriber agrees to pay the Company $—— each month, whether any gas is used or not. In addidition to the above monthly charge, subscriber agrees to pay for all gas consumed, as shown by the registration of the meter, during each month at the following schedule, bills payable monthly on or before the 15th of the month following that for which the bill is rendered:

1st	25,000	used	in	any	month	through	1	meter,	90	cents	per 1,000
2d	25,000	"	"	"	"	"	"	"	80	"	" "
3d	25,000	"	"	"	"	"	"	"	70	"	" "

And for all gas in excess of 75,000 cubic feet, 70 cents per 1,000 cubic feet.

"A discount of 10 cents per thousand cubic feet will be allowed on all bills paid at the Company's office on or before the 15th of the month following that for which the bill is rendered, but no discount will be allowed after the 15th of the month, and unless the account is paid by that date the Company reserves the right to discontinue the supply of gas without notice to the customer. This contract shall continue in force for not less than one year from date hereof, aud at the expiration of the first and of each subsequent year, this contract will be considered as renewed for another period of one year, unless either party hereto gives 30 days' notice, previous to the expiration of any year, of his desire to terminate this contract. The subscriber has the right to revert to the regular rates of the Company at any time by notifying the company, in writing, and in such case the difference between the amount he has actually paid, and what he would have paid under the regular rates will be adjusted for the expired portion of the contract.

"Subscriber enters into this contract voluntarily, preferring the 'Readiness to Serve' method of charging to the regular rates now in force by said Company.

"In Testimony Whereof, both of the said parties have hereunto set their hands and caused these presents to be executed by their duly authorized agents."

Date..... Signed.....

The special industrial rate which we make to manufacturers is as follows:

"In accepting this contract the subscriber hereby agrees to pay monthly to said Company $—— —— for 'Readiness to Serve.' This charge to be made whether gas is used or not. All gas consumed, as shown by the registration of the company's meter, during the month will be billed at the following schedule, bills payable monthly on or before the 15th of the month following that in which said gas was used:

1st 25,000 cubic feet used during any month through any one meter	80c.	per 1,000
2d 25,000 cubic feet used during any month through any one meter	70c.	"
3d 25,000 cubic feet used during any month through any one meter	60c.	"
For all gas in excess of 75,000 cubic feet during any one month	50c.	"

"A discount of 10 cents per 1,000 cubic feet will be allowed on all gas bills paid at the company's office on or before the 15th of the month following that for which the bill is rendered. This contract and agreement shall continue in force for not less than —— year from date. Subscriber enters into this contract voluntarily prefering the 'Readiness to Serve' method of charging to the regular rates for gas now in force by said company."

Our demand charge based on the capacity of the meter required to serve the customer is as follows:

									Per Month.
3-light	meter,	old	style,	capacity	96	cubic	feet	per hour	$1.00
5- "	"	old	"	"	117	"	"		1.50
5- "	"	B	"	"	167	"	"		2.00
10- "	"	old	"	"	146	"	"		1.50
10- "	"	B	"	"	285	"	"		3.00
30- "	"	B	"	"	672	"	"		7.00
60- "	"	B	"	"	1,362	"	"		14.00
80- "	"	old	"	"	720	"	"		7 50
100 "	"	old	"	"	759	"	"		8.00
100- "	"	B	"	"	1,920	"	"		19.50
150- "	"	old	"	"	1,320	"	"		13.50
No. 1-A	Sprague	meter		"	165	"	"		2.00
No. 2-A	"	"		"	300	"	"		3.00
No. 3-A	"	"		"	345	"	"		3 50

NOTE.—Calculations based on 2-inch initial pressure with ½-inch loss.

This schedule is worked out on a basis of 1 cent per 1 cubic feet meter capacity with charges advancing in even figures of 50 cents or $1. For example, for 117 cubic feet meter capacity we charge $1.50 instead of $1.17, and for a 5-light B. meter with a capacity of 167 cubic feet per hour we would charge $2 and not $1.67.

The application of these rates would be as follows:

ILLUMINATING RATE.

Example No 1.—Gas Consumption for January, 1914, 10,000 Cubic Feet, at 90 cents per 1,000 cubic feet	$9.00
Monthly demand charge (5-light B. Meter	2.00
	$11.00
Less 10 cents per 1,000 cubic feet if paid on or before February 15th	1.00
Net Bill	$10.00
Example No. 2—Gas Consumption for February, 1914, 15,000 Cubic Feet, at 90 cents per 1,000 cubic feet	$13.50
Monthly demand charge	2.00
	$15.50

Less 10 cents per 1,000 cubic feet, if paid on or before March 15	1.50
Net Bill	$14.00

Example No. 3.—Gas Consumption for March, 1914,

40,000 cubic feet, 25,000 cubic feet at 90 cents per 1,000	$22.50
15,000 cubic feet at 80 cents per $1,000	12.00
Monthly demand charge	2.00
	$36.50
Less 10 cents per 1,000 cubic feet if paid on or before April 15th	4.00
Net Bill	$32.50

It will be seen that the consumer of 10,000 cubic feet pays at the rate of $1 per 1,000, which is our maximum regular rate, though he buy on the same contract which sells the consumer of 40,000 cubic feet at a fraction over 81 cents per 1,000.

Our Industrial rate offers a special inducement to large users of gas and is so regulated as to benefit only the large consumers. This rate is not offered to any customer whose requirements are estimated below 25,000 cubic feet. We are very careful in calculating his demand, otherwise we might get into trouble placing a meter too small to supply him, and on a demand charge which would sell him gas below what he is justly entitled to. This rate has given very good satisfaction to our customers and we have taken on a great amount of business we have not heretofore enjoyed. The following examples shows the possible reduction from our regular maximum rate.

Gas Consumption for November, 1913, 136,000 *Cubic Feet.*

1st 25,000 at 80 cents	$20.00	
2d 25,000 at 70 cents	17.50	
3d 25,000 at 60 cents	15.00	
61,000 at 50 cents	30.50	
Demand (30 light B meter)	7.00	
	$90.00	
Less 10 cents per 1,000 discount if paid on or before December 15th	$13.60	
	$76.40	or 0.561 per 1,000 net.

This represents a consumer we secured in very close competition with a steam plant to furnish heat for drying medicated brick. His subsequent consumption was as follows:

December, 1913, 112,000 cubic feet; January, 1914, 148,000; February, 148,400. Under this rate he has given us approximately the same volume of business we would have gotten from 22 consumers using 2,500 cubic feet each per month. We have taken on about one million cubic feet per month of similar business that could not have been otherwise secured.

The rates established in Chattanooga are intended to suit local conditions, and this is a matter to be considered by any Company contemplating new rates. Our competitors are bituminous coal, wood and coke. Soft coal can be had as low as 90 cents per ton, delivered and very good grades for $1.30. Coke at $2.25 per ton makes it just a little difficult to induce the consumer to use gas for industrial purposes, hence it requires an attractive rate to land this business. It is not, however, prudent to make a rate lower than necessary, and therefore we should study very carefully our local condition and the business we expect to get before making a contract. This is exactly the way our electric brother handles the matter of rates and the many steam plants replaced by electric motors indicate that he has been successful. The eagerness with which the business is sought is another indication that it offers profit to the electric company.

During the past few years an opportunity to sell gas to manufac turers on a large scale has come to most every gas company. Appliance makers have developed appliances adapted to most every use, but the most essential thing for the successful introduction of these goods is the establishing of satisfactory gas rates. I trust, therefore, that the companies represented at this meeting will look into this matter of better rates for large consumers with a view of establishing them in their respective cities, and in this way give the gas business in the South the general publicity it deserves, and which, in my opinion, will do more to encourage its use than anything else.

THE Dover (Del.) Gas Light Company has completed the extension of its pipe lines to Camden and Wyoming, 3 and 4 miles distant, having laid 37,000 feet of main.

Office Practice.

[Prepared for the Sixth Meeting, Pennsylvania Gas Association, by Mr. L. L. CADWALLADER.]

It will be a difficult matter to outline a method of handling the many duties of a gas office, that would be sufficiently elastic to be applicable alike to a very large company and to smaller ones.

As the range of companies represented in this association is rather wide, we will endeavor to strike a happy medium and deal with a system suitable to an average size situation.

In a town of medium size, it is not always practicable or advisable to departmentize the various fields of work, and in these cases the wheel of organization must center in the Superintendent, the hub of the wheel being the office.

In choosing the employees of the organization who will meet the public, great care should be taken to select only those whose ideas of diplomacy are highly developed. Too often this attitude is required only of the soliciting force, and the office filled with men whose only claim to the job is their ability to handle a pen. The successful merchant is one who keeps trade after it starts his way, not the one who temporarily attracts great throngs of customers only to "kill the goose" by employing dishonest methods or treating his customers discourteously. Every employee of a public service company should be taught to forget that he is the representative of a monopoly. The same methods of handling the public should be employed as if a dozen other concerns in town handled the product he is trying to sell. If he does otherwise he violates a trust, is not reflecting the ideals of his employers and is usually, unconsciously, preparing himself for a change of position. The office should be peopled with men of even higher standard than the solicitors, as they are required to meet the public at so many different angles.

The arrangement of the office is a matter for serious consideration. Rather than have symmetry of order, let us study the convenience of our public and arrange the fixtures accordingly. Have the chief clerk or other person designated to handle "kicks," far removed from the cashier's window. It is difficult to look pleasant when, during the "last day" rush your patrons, ask for duplicate bills, but you will have to accommodate those who occasionally forget, and reform the "habituals," and this can be better done by employing courtesy than by any other means. After all, our conditions of employment involve certain unpleasant duties and the true test of a man's worth is his ability to rise above unusual situations. In endeavoring to satisfy a complaint from a customer, it is mighty undiplomatic to hide behind the "rules of the company." This is primarily a confession of your weakness, and what is more, it tends to inflame the feelings of the "Corporation hater" that you are trying to convert. All rules and laws are based on logic and good practice, and it is better to explain this feature of the situation rather than to stand pat on rules. The great world powers maintain ponderous fighting equipment, not so much because of their anxiety to fight, but to give their neighbors a demonstration of their complete preparedness for a scrap. Our work is not exactly a continuous warfare, but our office should be so equipped that it will be an efficient bulwark against attack so that the force of these attacks will be spent and dissipated before the movement gets too big to handle.

Of course, the office represents more than this, and the writer has probably spent more time on this preamble than he will on the real text of the paper; but it does seem all important that we keep before us the fact that in this age of keen competition it is about as difficult to keep our patrons as it is to secure new ones. Any step to attain this ideal condition seems to be one in the right direction.

The office is a clearing house for all orders entering and leaving it. All orders for new work, complaints, etc., are active until completed, and the office must keep its fingers on each one while it is alive. We are all interested in the proper dispatching of our work orders. They enter through the medium of the solicitors. The solicitor should have his order book arranged in triplicate, the consumer getting the duplicate, the office the original, the triplicate to be retained by the solicitor or his executive. The original order should be passed to the chief clerk for his approval as to the credit of the consumer, and he will receipt for money turned in by the solicitor. The order, if approved, may then be passed to the order clerk, who will issue a work order in triplicate. The triplicate to remain in the temporary file in the office, the duplicate and original to go to the shop. The original contract is filed and becomes a permanent record. The original work order is issued to the fitter and

the duplicate held as a check against the return of the original. When the fitter executes his order it is returned to the shop, then sent to the storekeeper to check off the material used and finally returned with the duplicate to the office where the triplicate and duplicate are destroyed and the original filed after the proper ledger entries are made. Some time during the life of the order some one may have some interest in the date of completion. This is apt to cause delay in the order of things if some system is not employed. Nothing is more annoying to the shop man than to be quizzed many times through the day by some one in the office asking what he terms "fool questions." There is usually too little sympathy between the shop and the "white-collared" members of the force, and the consumer is apt to want more than "progress" reports when he makes an inquiry after an order.

A simple method to overcome this trouble is to provide the order clerk with a rubber stamp to be usod on the duplicate and triplicate. This stamp to contain the following, with a space for a date after each item:

Shop.....	Storekepeer.....
Wagon.....	Office.....
Fitter.....	Cancelled .....
Shop.....	Postponed.....

The triplicate will be posted from information received morning and noon from the shop, just after the hours of dispatching the fitters. With the information properly entered, it will be a very simple matter for the order clerk to give accurate information without delay and without stopping some busier man. The system appears to be cumbersome, but it will work if started right. Much has been said pro and con, and many dollars wasted on a consumer's history record. It would seem that the finished work order tells a better story than any transcribed record, and if the files are properly checked and periodically overhauled, and all orders over 6 months old removed and stored, there will be no clogging of them, and there will be a complete record sufficient for working purposes. A universal file for all work orders seems to be popular and comprehensive. A cheap envelope, provided with a slot, after the order of an outlook envelope, will serve to keep the orders for each premises separate.

The meter reading period should be arranged so that there will be ample time for billing. An all important factor is regularity in reading meters. It must be remembered that a delay of 5 days in reading a certain district will mean that the entire book will call for nearly 20 per cent. increase in consumption. This will cause back-fence caucuses among the consumers and an avalanche of complaints will follow in this wake. Aside from this there will be an irregularity in the gross sales that will have its effect in the monthly report. Regularity in mailing or delivering bills is essential. Gas bills are an overhead charge in every household or business, and the consumer is or should be waiting for it so that he can settle. Most people will pay promptly if they do not dispute the bill. If there is any such dispute get after it and clean it up. It is much easier to settle these things as they arise. If the consumer is habitually delinquent and cannot be taught to willingly pay his bills promptly he is easily spotted and should be reached another way. There is often a tendency on the part of a company operating in new fields or where there is keen competition, to let down a little on the matter of enforcing collections. This is a great mistake. The public at large does not expect it and it is up to us to maintain the dignity of our business. Collection expenses and accounts written off means in the end an annoying charge against operating expenses, so that eternal vigilance is vital in the matter of extended credits.

Next in importance to the handling of the public is the matter of our system of accounting. It will not be the province of this paper to attempt to outline a series of forms to cover this matter. The manager is interested most in a manufacturing report, but the directors and stockholders are usually too busy to even look at anything but a balance sheet. They are men of affairs, who are interested in just how busy each invested dollar has been during the past year. Each wants to know what he is worth rather than what he was or will be worth. To get this matter before him we must compile a sheet showing net figures. Statistics are easy to compile if our distribution of expenses is correct. The system of accounting should be complete, but there is a great difference in a complete system and a cumbersome one. The efficient account will save his employers money in avoiding useless forms and extra labor.

While it is true that we live in an age of specialists, we cannot afford to specialize on anything but net results. We cannot without allowing our organization to become top heavy, develop one department at the expense of another. We are obliged to think, talk, dream and live "SERVICE," and the best way to keep our fingers on the pulse of our public is through the medium of our offices.

Subaqueous Concrete Construction.

[From a paper by J. E. HOLDCROFT in *The Contract Record.*]

A new system combining the advantages of solidity of construction, adequate reinforcement against extraordinary stresses, and moderate cost, and not requiring heavy false work, or expensive travelling cranes and other gear necessary with the so-called "block system" of concrete construction in harbor improvements are the requirements the inventors of the "Vibrocel" system claim to have met almost perfectly.

The coined word "Vibrocel" embodies the two main features, viz, the vibration of the concrete and the cellular construction of the sections or units. Neither of these features is new, but their combination makes the cellular construction economically possible, while the carefully thought-out details largely eliminate that handling of heavy loads and the scaffolding which is such a costly item in most large structures.

Vibrated concrete is not only water-proof in the ordinary acceptance of the term, but absolutely damp-proof. A vessel with sides only one-half inch thick has stood full of water for months without a trace of dampness appearing on the outer surface. In a cell with walls 2 inches thick, 3 feet high and 7 feet in diameter, a similar one of 5 feet diameter, was floated, sufficient water being put in to rise almost to the brim of the outer cell. In spite of the fact that the inner cell displaces nearly a ton of water, and that it has been floating so since June, 1913, no trace of dampness has appeared on the walls or bottom of the outer cell and only very slightly in one corner of the inner one. Tests made bring out the surprising fact that vibrated concrete has about double the compressive strength of rammed concrete.

It is possible to build up, as a series of hollow cells, a complete shell of the proposed structure, using for the thin cell walls a rather rich, fine grained concrete. These walls carry a continuous reinforcement of expanded metal throughout the structure and, in addition, steel bars embedded in the cells, forming a series of triangles with them and extending to the outer walls. The hollow cells are then filled with a lean mixture of concrete containing plums, or in some parts of the structure gravel alone may be used, the cell walls supplying all strength necessary. The coarse, cheap material is thus in a proportion of about 10 to 1 to the rich reinforced concrete. Thus we have weight and solidity, and continuous steel reinforcement throughout the mass—a very desirable combination, especially in subaqueous work.

The hollow cellular waterproof concrete give the builder power to erect his structure in large sections (minus the filling), afloat in a sheltered position, or near his base of supplies, then to tow them out to positions where they can be sunk by blowing out the cell bottoms with embedded cartridges after the section has been lowered to within a foot or two of the previously prepared bottom, by admitting water.

It is practicable to build bridge piers, quay walls, docks, etc., without the usual expenditure for coffer-dams, temporary piers or expensive form work, and without any heavy machinery, save that required for dredging, which would be the same in any system of construction.

Vibrocel Cells in the Making

The construction generally is commenced by forming a concrete floor with upstanding dowels at the points where the walls forming the cells unite. On these dowels are places pillars 3 feet high, made of vibrated concrete, each carrying 3 wings of reinforcement which overlap with the wings of the adjoining pillars and are embedded in the walls. To every pair of pillars so placed are bolted wooden shutters (or forms) forming the moulds in which the concrete walls, 3 feet high, are cast, embedding the reinforcement. During the operation of filling the space between the shutters with

concrete, pneumatic vibrators (hammers) are applied to the shuttering. The reinforcement extends a few inches above the tops of the walls, and will be included in the next tier of cells, also 3 feet high, making the reinforced concrete walls and pillars continuous throughout the structure. Dowels are placed in the tops of the pillars, and any desired height can be obtained by a repetition of the process, carried out in successive 3 foot tiers, resulting in continuous walls of concrete reinforced from bottom to top of the structure. No scaffolding is required, the whole extent of the work being accessible by means of loose planks laid upon supports extending above the top of shuttering carried up as the work rises.

No heavy machinery is necessary, and no single part of the work is too heavy for a couple of men to handle. Among the many remarkable results of vibrating concrete "in situ" is the fact that the joint between old and new concrete is absolutely homogeneous.

There are several factors which tend to reduce the cost. For example: (1) Roughly speaking 90 per cent. of the mass is of cheap, lean concrete. (2) No complicated form work is required, the forms used being simple square sections which can be used repeatedly. (3) The work is a continuous repetition of the same details, conducing to constantly increasing speed and cheapness. (4) No heavy machinery or scaffolding is required. (5) No cofferdam or pumping is required, the cells being filled, after placing in position, with bagged concrete or by tremies. An estimate, including profit and royalties, places the cost at about $9 a cubic yard—this, for completed work, including everything but excavation or dredging. Where gravel filling can be substituted for concrete in some of the cell sections, the cost can be furthor greatly reduced, sometimes working out as low as $5 to $6 a cubic yard.

English Radiant-Fuel Heating Stoves.

[From the Cantor lecture on "Coal Gas as a Fuel for Domestic Purposes," by MR. F. W. GOODENOUGH, of the Gas Light and Coke Company, London, England.]

There is no historically verified record of any savage tribe, even in the tropics, with no knowledge of fire. The art of cooking is nowhere unknown, not even to the cannibal; and our rude forefathers doubtless learned the art of making fire when they were chipping flints to make domestic and less peaceful implements. The fuel employed for the production of heat has generally been some form of vegetable matter. Its natural evolution may with no serious degree of inaccuracy be described as being from air-dried wood, through artificially-dried wood (charcoal), partially compressed, but moist, vegetable matter (lignite), to the fully compressed vegetable matter which we call coal; thence, by artificial means, to the essence of coal in the form of gas.

In every stage, the gas volatilized in the process of combustion from the substance consumed has given the vital flame. When, therefore, we arrive at the stage of being able to buy the vital essence, unencumbered by the grosser body in which it was imprisoned, surely we have got very near to the ideal fuel.

When the essence of coal is burned in our houses, our chimneys emit into the atmosphere none of the tarry vapors that arise from the smoky fire, because at the gas works from every ton of coal there have been extracted ten gallons of tar, and the absence of these tarry vapors reduces materially the formation of fog. Again, the burning of the purified essence of coal instead of the crude article means that when the 12,000 cubic feet of gas extracted from the ton of coal are burned in our fireplaces and kitchen-stoves, instead of the 33½ pounds of sulphur only ½ pound, not more than 1½ per cent. of the quantity originally in the coal, goes into the atmosphere. Moreover, the small percentage of sulphur which a gas fire discharges up its flue is in the form of sulphur dioxide, without the considerable quantities of sulphuretted hydrogen and ammonia, as is the case with the ordinary coal fire, which also emits such noxious products as formic aldehyde and carbon monoxide.

If we use the essence of coal instead of the crude substance in our fireplaces, we discharge into the air no unconsumed carbon, as we do in such large quantities when we carry on our carbonization of the coal in an open grate, instead of in a closed retort.

Observations recently carried out showed that no less than 61,000 tons of solid matter are deposited annually on every square mile in the City of London, and that a very large proportion of this is wasted carbonaceous matter mainly from the domestic coal fire and grate.

Obviously, therefore, the universal use of gas instead of coal as a domestic fuel would have a very marked effect in diminishing the amount of dark fog from which our cities suffer. It is inevitable that we should have mists under certain conditions of barometer and thermometer, but the difference between mist and fog is a very wide one.

It is a fact freely commented upon by other speakers and writers on the subject of smoke abatement, that the intensity and duration of fogs in London have diminished materially in recent years, by the rapid displacement of coal as a fuel by its purified essence. The advantages of smokeless over smoky fuel being granted as obvious from the point of view both of public health and economy, there naturally arises the question: What are the practicable and desirable alternatives to smoky fuel for domestic purposes?

My answer is: Coal gas, with the assistance of coke in certain conditions and circumstances. Coke is, at normal prices for both, cheaper for constant use than gas; but it is outclassed by gas for certainty, regularity and flexibility, and gas has the advantage over coke of entailing neither dirt nor labor.

There are large fields for the advantageous and economic use of coke; and there is no question of coal gas displacing coke in many places where it is used with economy at the present time. As a domestic fuel, however, coal gas has a much wider field of usefulness than coke.

No one who has studied the figures as to the relative amount of heat procurable from the quantities of gas and electricity that can be obtained at the prices at which the two sources of heat can be supplied with profit, can regard electricity as being a serious competitor of coal gas as a domestic fuel. It is not, as in the case of illumination, a question of infinite possibilities. The possibilities in the case of converting any form of potential energy into heat are strictly limited and defined. You cannot get more heat out of a pound of coal than its complete combustion will give; and the same applies to any given quantity of any other form of fuel. Electricity as a heating agent has its field; but it is a limited one, until current can be supplied at a mere fraction of its present cost. Smokeless solid fuels, other than coke—such as coalite and other forms of incompletely carbonized coal—have hitherto proved too costly to command anything but a very restricted market. Oil stoves have their use, more particularly in country cottages; but they also have their disadvantages, and are not found displacing coal in cities where coal and gas are at reasonoble prices.

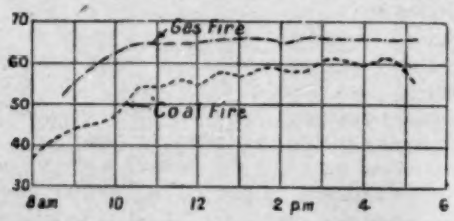
The question then, comes down to this: To what extent can gas at ordinary town prices be adopted in place of smoky fuel in the home with advantage to health, comfort and convenience and economy? This evening I can only deal with the question of gas as a fuel for the heating of the home.

The case for gaseous fuel on the side of comfort and convenience hardly needs to be argued. It was summarized effectively 20 years ago by the special commission appointed by the *Lancet* to report upon "Smoke Prevention and Perfect Combustion." In the report of this commission, the manifold advantages of gas over coal fires are thus referred to: "None will deny the convenience of such system. With gas, a bright fire can be obtained at any moment, night or day. The heat can be regulated to a degree, the fire can be stopped at will, the conveyance of coals dispensed with, and the oftentimes troublesome process of lighting with wood and paper is avoided; while cleanliness is an inevitable result of a gas installation." The report touched upon economy, by adding: "At first sight it would appear that gas as a fuel compares unfavorably with coal in regard to cost; but when all the features—cleanliness, convenience and manipulative advantages—are taken account, gas used rationally runs coal very closely, even on the score of expense."

This aspect of the question was also referred to in the report made to the Coal Smoke Abatement Society in 1906, upon an experimental inquiry conducted by Dr. Des Vœux and Dr. Owens—into the thermal efficiency of, and hygienic considerations relating to, the use of gas stoves. In this report it was pointed out that when the initial raising of the temperature of the rooms had been accomplished, and the fires had produced a fairly steady rise, the cost per hour for each degree of rise in temperature was about four times as great with gas fires as with coal. "This does not necessarily mean that gas is always more costly than coal; other factors must be considered—such as the rate at which the room is warmed."

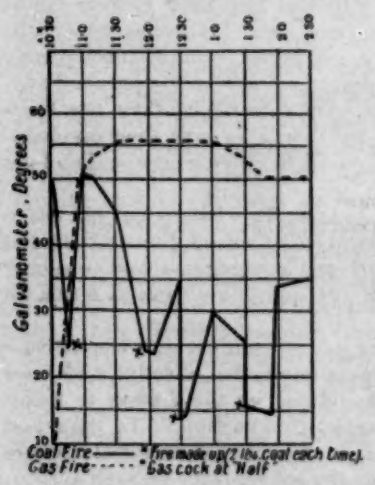
It was found that while the gas fires usually produced a fairly steady temperature in the rooms in from 1 to 2 hours, the coal fires took much longer. This is clearly shown by the diagram giving the comparative rises and falls in the temperature of a room with a coal

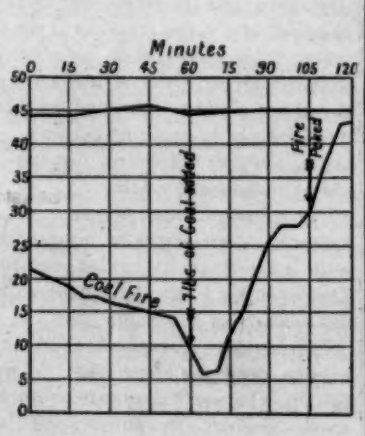
fire and a gas fire. Even more striking than this diagram are two others illustrating the results of some experiments made by Messrs. Webber and Brearley, as to the comparative steadiness of the radiant heat given off by a gas fire and a coal fire. These show how much more regular is the temperature of a room heated by a gas fire—a point of material importance in cases of sickness, and having a distinct bearing upon comfort and convenience in everyday life.



Showing Variations of Room Temperature with Gas Fire and Coal Fire.

A properly constructed gas fire has the advantage of a coal fire from a hygienic point of view, owing to the more equable temperature and the absence of dust and smoke. The essence of their conclusions is found in these words: "A properly constructed gas stove, with a flue sufficiently large to carry away the products of combustion, although for constant use more costly than a coal fire, is quite as satisfactory from a hygienic point of view, and does not in any way vitiate the air of the room, nor does it produce any abnormal drying effect as is popularly supposed. It will carry off from 2,000 to 4,000 cubic feet of air per hour; and this is a valuable ventilating effect"—but one that does not entail the cutting draughts caused by a blazing coal fire. This ventilating power of a gas fire is sometimes described, by those who are not exactly its friends, as "consuming the oxygen in the room"; but this applies with equal or greater force to the coal fire, and would only mean anything if we shut ourselves up in air-tight compartments.

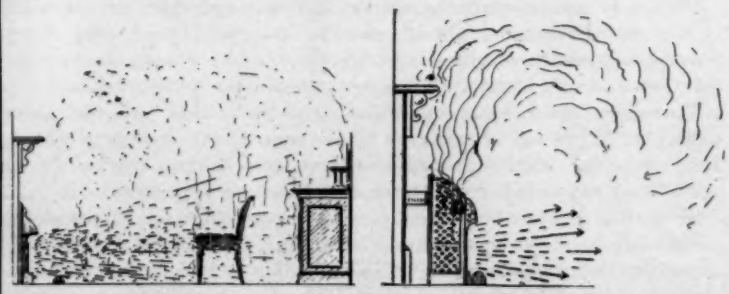




This brings us directly to the very important question: Can gas be used in place of coal without disadvantage from the hygienic point of view? There can be no doubt, from these researches, and indeed from a common-sense consideration of the matter, that gas fires not only have no hygenic disadvantages, but, on the contrary, have a marked superiority in that respect.

An explanation of the difference between the old and the new gas fires will be better understood if I emphasize the good points of the modern gas fire. The one great point in its favor is that it gives its warmth mainly in the form of radiant heat, doing only a moderate amount of heating by convection and that at a low temperature, while at the same time it acts as a valuable ventilating instrument.

The difference between heating by the radiant open fire, and by appliances that depend for their effect upon heating by convection is difficult to exaggerate. Heating by radiation is Nature's method of heating—the method by which the sun gives us warmth. Radiant heat (that given off by an incandescent body such as a brightly burning coal fire, gas fire, or the sun) differs from convected heat, which is the heat conveyed to the air by contact with a solid body, in the essential feature that the radiant heat passes through the air without directly affecting its temperature, and only raises the temperature of objects with which it comes in contact. This can be quickly demonstrated by a galvanometer. You are all familiar with the great difference in the temperature registered by a thermometer in the sun from that registered in the shade, even though the two thermometers be separated only a few inches, and are both enveloped by practically the same air. You all know that if you are sitting in front of a glowing fire, it only needs a thin fan to protect your face from the scorching effect of the fire, though the air surrounding your face remains unchanged. You know how cold you can feel if someone stands on the hearth between you and the fire. Those of us who are familiar with high altitudes know what it is to walk up a mountain path in the morning with icicles a foot long hanging from the rocks on the shady side of the road, while one is getting gloriously burnt in the rays of the sun; and we have seen the icycles melt away rapidly when the rays of the sun eventually fall upon them.



If, then, we sit in a room which is heated mainly by radiant heat, we are in a room where we ourselves, the walls, the furniture, the floor, and the other solid objects, are raised in temperature by the radiant heat that falls upon us and them, while the atmosphere remains unaffected directly by the heat of the fire, and is only raised gradually and comfortably in temperature by contact with the warmer objects in the room. As bodies of higher temperature radiate their heat to bodies of lower temperature, it is obvious that the human body at a temperature of 98° will lose its heat less rapidly to objects which are at a temperature of between 60° and 70° than it will to objects between 30° and 40°. A room heated by radiation is, therefore, from this point of view, more comfortable to sit in, and when we consider that the raising of the temperature of air increases its capacity for absorbing moisture, we realise another very important aspect of the difference between heating by radiation and heating by convection.

The term "dryness of air" is often misconstrued. A dry atmosphere will necessarily contain less water vapor than a wet atmosphere, but its degree of saturation—*i.e.*, the proportion of water vapor present in the air to that necessary to produce complete saturation—is less. This distinction is rather important in connection with the maintenance of any desired degree of humidity, when considered in conjunction with the subject of warming. The capacity of the air for water vapor varies enormously with the temperature, as is shown by the following table:

Temperature of Air. Deg. Fahr.	Vapor Tension Ins. Mercury.
40	0.247
45	0.299
50	0.360
55	0.432
60	0.517
65	0 617
70	0 732
75	0.867

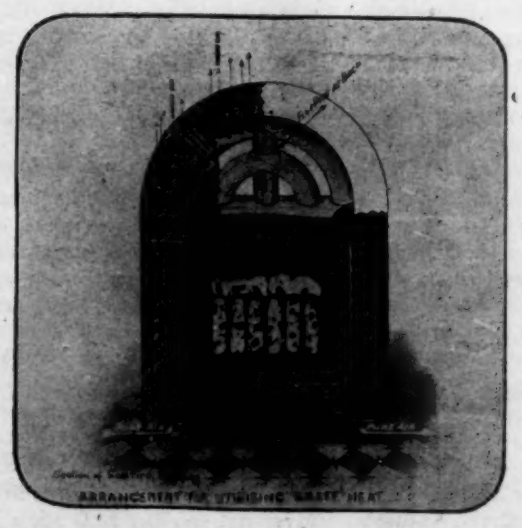
If, therefore, air at a certain temperature and with a certain degree of humidity becomes warm, its humidity must necessarily decrease, providing no measures are taken to add water vapor to compensate for the increasing temperature.

In a room heated by radiators, so called, it would seem, because they heat by convection and not by radiation, or by hot-water pipes, or by having warm air poured into it, the body is losing heat more rapidly to the surrounding objects, because they have not been raised in temperature by radiant heat, than it would in a room heated by a radiant fire; and the body is losing moisture more rapidly to the air from the skin, the eyes, the membrane of the nose and throat and lungs than it would in a room where the air is kept at a moderate temperature. Is it, then, to be wondered at that in a room heated by convection methods one so often gets cold feet, a hot head, a thirst, a headache, and a general feeling of lassitude?

The open coal fire (when it is in a state of glowing radiation) and open gas fire approach most nearly to nature's method of heating; and, therefore, possess enormous advantages, from the point of view of health and comfort, over systems of artificial heating that depend

for their effect upon the warming of the air of the rooms. This has been brought prominently to public notice by eminent scientist, but more especially by Prof. Leonard Hill, who, in his presidental address to the Physiology Section of the British Association, gave it as his opinion that far more important than the chemical purity of the air of a room, was the question of movement of the air, and the keeping of the air of the room down to a temperature at which the body parted with its moisture at a rate that was normal and agreeable. He has since constructed an instrument called a "comfort-meter," for indicating the condition of the atmosphere of the room in its relation to that condition which is essential to comfort. I understand that Professor Hill is about to carry out some research with this ingenous in instument on rooms warmed by different systems of artificial heating, and no doubt they will reveal that the open gas fire produces and maintains a comfortable condition of atmosphere more completely and surely than any other system of artificial heating. It was because the old fashioned gas fire did so much of its work by convection heating at high temperature, that gas fires got the reputation of drying the air of a room. The radiant gas fire, as distinct from gas heating stoves, came into being as the result of the invention of the Bunsen burner, whereby, owing to the introduction of air into the gas prior to its ignition, the complete combustion of the gas was made possible in spite of the flame coming into contact with a solid body.

The original type of gas fire (by which term, in contradistinction to a gas heating stove, I mean a warming apparatus in which the heat of the gas is utilized to raise some refractory substance to a glowing heat, and the products of combustion are carried off by a flue for discharge into a chimney) was generally on the lines of the cut which illustrates a section of such fire. The products of combus



tion were conducted through a series of tubes in the top of the stove covered over by open metal work, making a chamber in which the air was heated to a high temperature by contact with the heated tubes. The fire clay back of the stove was set back from the line of the front of the burners to permit of a large quantity of fire clay balls being placed above the burner for the purpose of being heated by the gas, and the canopy of the stove came well down towards the top of the fire clay lumps. The arrangement of the artificial fuel bore no precise relation to the nozzles of the burner; there were no means of adjusting the relative proportions of gas and air entering the burner; and no arrangement by which one portion of the burner could be lighted and not another. The flue opening very frequently bore no obvious relation to the quantity of gas consumed in the fire, the same size opening being for a fire of small consumption, as for one of large.

By degrees the gas fire has been improved both in construction and in design. Without going chronologically through the stages of evolution, I will come at once to one of the many efficient and well-constructed gas fires of to-day.

The burner is made so that only the centre jets need be alight if the whole heating force of the fire is not required. This is an infinitely better arrangement than turning down the whole of the fire if it is desired to moderate the heat given out. The burners have arrangements for adjusting the gas and air supplies to give the very best results. The fire back is only so far from the front of the fire as to allow of one row of fire clay "fuel" or "radiants." The result of this arrangement is that a very large proportion of the heat from the flame is either absorbed by the radiants within which the flame burns or by the fire clay back instead of, as in the older type of fire, a considerable proportion of the heat being lost up the flue through cold air being drawn into the fire between the front of the fire clay lumps and the fire brick back. The fire clay back to-day is also designed to throw as much as possible of the heat which it has absorbed from the flames, by radiation into the lower portion of the room. For the same quantity of gas as was used in an old pattern fire with 10-inch opening, a glowing fire 16, 17 or even 21 inches wide can be secured. These wide fires are extremely useful for the heating of large rooms.

The fire clay radiants are in long pieces, one over each burner nozzle made to fit accurately so that the flame has free access to the interior of the radiants without any disturbance of the flame. This is a very important point, as if the flame of a Bunsen burner comes into contact with cold solid material too quickly, the inner cone of unignited gas is broken, the flame cooled, and imperfect combustion of the gas ensues, resulting in the production of a small quantity of carbon monoxide, and an offensive smell, until the solid becomes hot. Flues are now made so that they can be set at varying angles as may be necessary, and there is sufficient space between the top of the radiants and the bottom of the canopy, to insure that a quantity of air is drawn into the flue by the fire, with a resultant valuable ventilating effect upon the room, without the air being all drawn through the fire itself, with a consequent cooling effect upon the radiant bodies.

Further (and this is a most important point), the products of combustion now pass from the fire direct into the flue—there being no air-heating chamber in the top which was the cause of dislike entertained by many people against gas heating, with the result that one found, and still finds, in front of many gas fires a bowl of water, which the user fondly believes corrects all the tendency of the gas fire to "dry" the air of the room.

What was the truth of the matter? Not that the gas fire dried the air of the room, but that it heated the air unduly, with the result that the capacity of the air to absorb and retain moisture was increased. This heated and thirsty air coming into contact with all the moist membranes of the eyes, mouth and throat, and with the skin, proceeded to satisfy its thirst for moisture, to the great discomfort of the occupants. Now whereas the old type of fire gave out only some 25 to 30 per cent. of its heating power as radiation and another 25 to 30 per cent. in high temperature convection, leaving a good 40 to 50 per cent. to go up the flue, the modern gas fire sends out well over 50 per cent. of its heat in radiation, only about 20 per cent. of heat in the form of convection (and that at such a low temperature that the air of the room is only very gently warmed), while 20 to 25 per cent. performs the necessary work of ventilation.

It is interesting to note the conditions of the *Lancet* commission 20 years ago and to see how completely they have been embodied in the modern gas fire. The conditions laid down were:

1. That it is desirable that the stove should afford radiant heat only.
2. That for this purpose some form of clay fuel should be used.
3. That attention should be given to the packing of the fuel so as to avoid clogging or impeding of the flow of the flames.
4. That the stove should be supplied with separate burners with taps. [This has been adopted only partially, as it is found unneces- to control each burner independently; it being sufficient to be able to control sections of burners.]
5. That some means of controlling the supplies should be adopted. Governors or regulators are indicated. [This condition is met by the recommendation given to their consumers by most gas undertakings to have governors on all gas fires.]
6. That a simple arrangement should be provided by which undue drying of the warm air may be avoided. [Subsequent research and experience have proved this unnecessary, as the modern fire does not unduly warm the air.]
7. That indestructible enamel should be used for covering the stove. Common paint, varnish, or ordinary enamel should be avoided.
8. That an efficient flue should in all cases be provided.
9. That the burner should be, as far as possible, noiseless. [This condition is fulfilled to a very great extent in all modern gas fires, though absolute silence is not always achieved.]

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NEW YORK, MONDAY, JUNE 8, 1914.

[Special Editorial Correspondence, by Telegraph.]

TENTH ANNUAL MEETING, IOWA DISTRICT GAS ASSOCIATION.

DAVENPORT, IA., May 28th, 1914.

The morning's session, in the New Kimball Hotel, was started with Mr. Lockwood's paper on "Domestic Appliances." The discussion thereon covered every phase of the subject; those out of the ordinary run taking-up the objections to over-ornamentation on gas ranges, and costs, etc., of ice-less refrigeration in small installations. Mr. E. S. McCarthy reported, as Chairman of the Standing Committee on New Business, dealing with the advantages of standardization of ranges and the importance of labeling them as such; advocating the support by the Association and its members of the scheme for National Advertising of Gas; and the advisability of selling appliances on liberal credits. Mr. W. F. Miller, Manager of the Davenport Hotel, spoke on the use of gas appliances in hotel kitchens from the point of view of the user, giving a number of important facts to be considered by the gas companies when selling installations.

On convening to-day's afternoon session, Mr. G. G. Kuhn read his paper on "The Storeroom," describing methods of administration and ways of regulating and checking stock on hand. Mr. Lee's paper on "Elements of Gas Rate Making," was next, and was read by Secretary Vincent, in Mr. Lee's absence. The discussion on this paper was mainly on the lines of Commission control, and the value of sliding scales as big business getters. Mr. Austin Burt then read his discussion of "Circular No. 32 and the Report of Committee on Thermal Value and Candle Power, Made to the Public Service Commission Second District, New York." Mr. Burt advocated a thermal value standard of about 570 B. T. U., at the works, with a minimum candle power limit of 16. Resolutions were adopted depreciating the duplication of association work, and recommending the amalgamation of the A. G. I. and N. C. G. A.; after which the session adjourned.

V. S. G.

DAVENPORT, IA., May 29, 1914.

Last nights banquet was an unqualified success, the attendance being large and the entertainment excellent. Long speeches were omitted and the whole effort was to have a good time. This morning's first business was the report of the Standing Committee on "Construction," Mr. C. I. Tenney, Chairman. It was read by Secretary Vincent, and covered a resumé of the year's improvements in apparatus, including discussion of vertical retorts, waste-heat boilers, positive pressure blowers, regenerators, and the use of exhaust steam in water gas sets. The report of the Committee on "Manufacturing" was read by Mr. T. B. Genay, dealing principally with various systems of purification, and the general handling of purifying boxes. Mr. Thos. Crawford reported for the Committee on "Distribution," dealing with the latest developments in high pressure work; and recommending cement joints only for smaller sizes of mains. The report on President's address was presented by Mr. L. L. Kellogg, Chairman of the Committee, endorsing its conclusions and complimenting the Association on the success of Mr. Blackwell's year of administration. Mr. Roper presented the resolutions thanking the Mayor of the city, and the President and other officers and workers of the Association for their untiring efforts; and at 11:30 the meeting was finally adjourned.

V. S. G.

BRIEFLY TOLD.

PROGRAMME OF MID-YEAR CONFERENCE, NATIONAL COMMERCIAL GAS ASSOCIATION.—All members of the N. C. G. A. are invited and urged to attend some, if not all, of the Conference Meetings, on June 11, 12 and 13. The programme announced is as follows:

Thursday, June 11—Meetings of various committees, and of the Board of Directors of the Association, in designated rooms in the Engineering Societies' Building, 29 West 39th street, New York City. Meeting of the Committee on the Development of Industrial Fuel, in the Assembly Room of the Consolidated Gas Company, 130 East 15th Street, where papers will be read covering the uses of gas in some 20 important manufacturing industries. Session from 10 A.M. to 12:30 P.M.; 2:30 to 6 P.M.

Friday, June 12.—Morning Session, 10 to 12.—General Conference at Engineering Socseties' Building. A paper on the "Organization of the Accounting Department of a Gas Company," will be read and discussed. A general discussion of these short topics will follow: Monthly Balance of Meters; Handling of accounts whose unpaid bills amount to less than deposit; Graphic charts in connection with reports from accounting department.

Afternoon Session, 2 to 4:30.—A paper on "Scientific Management as Applied to the Sales Department." Short topics: All gas kitchens; Pushing sales of slow-moving stock; The gas company's relations with architects; Garage and house heating; Church lighting; Operation and results ofcircularizing departments.

Saturday, June 13.—Morning Session, 10 to 12:30.—Demonstration of Industrial Appliances at the Industrial Sales Rooms, Brooklyn Union Gas Company, 1024 Fulton Street, Brooklyn, New York.

No tickets of admission are necessary and everyone is invited to these meetings.

DEGREE OF MASTER OF SCIENCE TO DR. ELLIOT AND TO MR. DUNN.—At the celebration of the fiftieth anniversary of the founding of The School of Mines, Columbia University, on May 29th, some 12 of her prominent alumni were given the honorary degree of master of science. Among those so honored were two men well known to the gas and electric fraternity: Mr. Gano Dunn, president of the J. G. White Engineering Corporation, and Dr. Arthur Henry Elliot, for many years chief chemist of the Consolidated Gas Company, New York.

THE METER GENERALLY RIGHT.—Holding that the record of a gas meter must be accepted as conclusive evidence of the quantity of gas consumed, unless there was good proof that the meter was inaccurate, County Judge Frank A. Bullock, of Lexington, Ky., gave judgment for the defendant in 16 cases in which consumers complained of their bills and filed suit against the Central Kentucky Natural Gas Company for recovery of what they considered the excess over proper charges. The case of John T. Holton was taken as a test, the evidence being practically the same for all. Mr. Holton had sued for $7.94, which he claimed was the amount greater than his gas bill should have been. He had been given judgment for it in the magistrate's court several months ago, but an appeal was taken by the gas company in this and all the other cases to the county court. The plaintiff offered testimony that the bill was very much larger than it had ever been in any other month under practically the same conditions, while the defendant had as its chief witnesses, its meter testers and bookkeeper.

APPRECIATION OF MR. GRIEBEL'S GIFT.—The Burns Federation of Edinburgh is plannin g to present a Scottish national tribute to Mr·

John Gribbel, of Philadelphia, for his very graceful gift of the Robert Burns Glenriddle manuscripts to Scotland. An elaborate album has been prepared, containing an illuminated address of thanks, and Lord Roseberry has been invited to present it to Mr. Gribbel on be half of the Federation.

GREATEST COKE PRODUCION.—All records in coke production were broken in 1913, according to figures of the United States Geological Survey, the output being 46,311,369 short tons, valued at $128,951,430. This is an increase over 1912 of 2,327,770 tons in quantity, and $17,146,317 in value. Of the 1913 production 33,296,669 tons were made in beehive ovens and 12,714,700 tons, or 27.4 per cent. in retort or by-product ovens. The increase in production of by-prodnct coke was over twice as large as the increase in beehive coke. The greatest increase in by-product coke production was in Alabama, where the gain was nearly 50 per cent., from 1,349,797 in 1912 to 2,022,959 in 1913. The increase in Pennsylvania was nearly one-third, from 1,974,619 tons to 2,628,680 tons. Indiana showed an increase of 110,686 tons, and Illinois of 94,609 tons. A large part of the coal used in by-product ovens in States that do not produce coking coal was obtained from West Virginia mines, the quantity of West Virginia coal made into coke outside the State being estimated at 7,800,000 tons. The quantity made into coke in West Virginia was 4,034,251 tons, and the quantity of coke produced therefrom, 2,472,752 tons.

MUNICIPAL PLANTS DON'T GET NEW BUSINESS.—That municipal gas plants do not succeed in selling as large average quantities of gas per consumer as do private companies, was the gist of a paper on "Municipal Gas Undertakings and the Consumer," presented by Robert Watson, of Doncaster, at a recent meeting of the Manchester District Conference of British Commercial Gas Association. Substantive statistics were given showing their very small average increases. The development of municipal plants is greatly hampered, he said, by opposition to anything that might be classed as municipal trading, whereas there is no such interference with the progress of private companies. In the face of such obstacles municipal authorities cannot do their best to stimulate gas consumption, and in the long run all local business suffers from the restricted use of gas.

INTOXICANTS AND ACCIDENTS.—In the widespread movement for education on the lines of "Safety First," attention is being drawn by some authorities to the influence of alcoholic beverages on the occurance of accidents. In Ohio, the American Foundry Association's committee on prevention of accidents, is about to petition the legislature to prohibit the licensing of saloons within 600 to 1,000 feet of a manufacturing plant, especially plants where the work is more than ordinarily hazardous, or where night work is done, or where women are employed. The key note of this movement is "Sobriety First; Safety Follows."

PROTECTION AND RECLAMATION.—Since the use of gas increases in proportion with an orderly and wholesome development of the country, gas men generally will be interested in the plan of Senator Newlands, of Nevada, and Representative Broussard, of Louisiana, for the internal development of the country through the solution of the flood and drought problem. These gentlemen have introduced a bill known as the Newlands-Broussard River Regulation and Flood Prevention Bill, to conserve and use the now wasted flood waters of the country. The bill gives the Executive Department of the Government the power to initiate plans and projects and continuing appropriations, territorially apportioned, of $60,000,000 a year for ten years, for the control of the source streams and the confining of remaining flood flow to the channels below. The idea is to impound in artificial and natural reservoirs, or divert the excess waters above, and use them in aid of agriculture, for the development of hydroelectric power and for the feeding of navigable streamflow in the dry season. In this way the formation of great floods will be checked, the control of the navigable rivers will become possible and, under the provisions of the bill, caving banks will be revetted, permanent levee lines created and maintained, and spillways and controlled outlets installed. The excess waters, which now keep some sections too wet, will be diverted to the sections which do not now receive enough moisture; soil erosion will be reduced, mountain sides will be forested, the farmers will be taught rainfall conservation on their own farms and the navigable streams will be made navigable all the year round. The paragraph specifically relating to the Mississippi River is as follows:

"That the control of the Mississippi River shall be regarded as a national problem, imposing an obligation which alone can be discharged by the general government for the preservation of the depth of its water for navigation, the building of levees to maintain the integrity of its channel, and the prevention of over-flow and its consequent devastation, resulting in the interruption of interstate commerce, and the enormous loss of life and property, which has resulted therefrom, and that the Mississippi River shall be improved and developed as a national waterway, exclusively under control of the Federal Government, and all work connected with the creation and maintainance of such a national waterway, including levees, revetments, bank-protective work, flood-water channels, outlets, spillways, and all work thereon herein contemplated or provided for, shall be done exclusively by and at the cost of the National Government."

The bill has been endorsed by hundreds of commercial bodies and by several state legislatures, and only recently received the approval of a majority of an Interdepartmental Committee of experts assembled by the Secretaries at the request of President Wilson to investigate and report on it.

THE SOCIÉTÉ TECHNIQUE.—The subjects to be discussed by the Société Technique de l'Industrie du Gaz en France at its next meeting are: (1) Means of combating napthalene deposits in the mains; (2) The principal causes of deterioration of mains; (3) The use of small coke in producers; (4) Practical details as to the working of large capacity producers. Wednesday morning, June 17, they have their annual business meeting; in the afternoon, papers for two hours and a half, and then a visit to the La Villette works. Thursday, papers all day and the Société's dinner at night; and papers again on Friday morning. On Friday afternoon there is to be a joint excursion with the Society of Civil Engineers of France, and the International Society of Electricians, to Lyons, reaching there about midnight, and on Saturday morning there will be lectures by members residing in Lyons, on what the visitors will find most interesting and profitable in the Lyons Exhibition and at the various works they will visit. In the afternoon the Exhibition will be visited and in the evening there will be a dinner, attended by the Mayor of Lyons and other notabilities. Sunday afternoon they will go to the new station of the Lyons Gas Company. Monday there will be the exposition, lectures, waterworks, heating stations, power stations. On Tuesday the excursionists will go to Grenoble; and they start back that night, reaching Paris on Wednesday.

AMERICAN GAS INSTITUTE COMMITTEE ON ACCIDENT PREVENTION.—Mr. J. B. Douglas, Chairman of the Committee on Accident Prevention, has sent to all members of the Institute this circular letter, with a supply of blanks to be used in reporting casualties:

PHILADELPHIA, PA., June 1, 1914.

CIRCULAR LETTER TO A. G. I. MEMBERS.

Dear Sir: Will you help us to be of assistance in preventing accidents by reporting cases on the enclosed blanks, a supply of which has been sent you?

Upon receipt of the information, we will make analyses to determine the predominating causes of the accidents and the order in which they occur. We will then suggest measures to reduce accident frequency in the industry.

Kindly bear in mind that we wish to begin analyzing cases as soon as possible, and send us as many reports as you can. I would suggest reporting from both old and new records.

We shall be glad to forward additional blanks as desired.

Very truly yours, J. B. DOUGLAS, Chairman.

ENGLISH INCREASE IN MAKE AND CONSUMERS.—From the Summary of Directory Statistics, published by the *Gas World*, London, in "The Gas World Year Book for 1914," figures are found for these comparisons of the production and sales by English gas companies.

	1912.	1913.	Increase per cent.
Gas make (millions)	210,499	220,747	.5
Number of consumers	7,143,748	7,333,401	2.6
Pre-payment consumers	3,541,925	3,785,351	.7
Number of ranges in use	3,228,642	3,504,192	8.5
Number of public lamps	769,240	771,016	0.2

1912 showed an increase in output of only 2¼ per cent., while the number of consumers increased 5½ per cent., and the number of ranges 10 per cent. A comparison of these percentages with those for 1913 indicate increasing use of gas on the part of old consumers, and evidence that the gas industry is advancing at a very satisfactory rate.

Tar.

[Prepared for Iowa District Gas Association, by MR. ALFRED HANSEN.]

The purpose of this paper is to describe the methods that may be used to refine and dispose of water gas tar at small gas works where modern apparatus for handling tar is not installed.

The quality of tar made will vary considerably if proper temperatures are not maintained constantly when making gas. If temperatures are too high, the lighter hydrocarbons or illuminants, which give to the gas its lighting power, will be decomposed, and free carbon or lamp black formed. If heats are too low, the tar recovered will contain ungasified oil, making it unfit for many purposes, for the presence of the oil reduces its binding power. It is, therefore, necessary to carry uniform heats to insure illuminating gas of high candle power and at the same time a tar of good quality. It is infinitely more important to make good gas than good tar, but if proper temperatures are maintained the tar also will be of good quality.

The character of oil used affects the quality and quantity of tar made, an oil containing high boiling oils yielding a less quantity of illuminants and more tar than one containing oils of low boiling point.

Sometime ago, the writer made a distillation test of the tar from a plant near Omaha that yielded only 8 per cent. of oil up to a temperature of 572° F. A good water gas tar should give off from 40 to 50 per cent. to this temperature. It was evident that the heats carried were excessive, resulting in a gas of low candle power and a tar almost entirely lamp black making it practically valueless. The value of a tar is based on its usefulness directly after being freed from water, and upon products obtainable by its distillation. If tar contains an excessive amount of free carbon, or ungasified oil, ideal operating conditions are not approximated. The value of tar containing ungasified oil to tar distillers, or if used under boilers or in generators, would, no doubt, be more than if it contained an excess of free carbon, but the gas in either case would be poor, and the method of operation costly.

The condensing system by which the tar is removed from the gas usually consists of a wash box, scrubbers, condensers. etc. The apparatus installed in small gas works for this purpose is limited; and therefore, outside of describing the system in a general way, it will not be necessary to describe newer forms of apparatus and results obtained either by slow or quick condensation. The gas leaves the superheater and enters the wash box or seal. While the gas comes in contact with water, it is only of short duration, for the gas is forced through under considerable pressure and is not divided into minute bubbles having contact with water. However, a decided drop in temperature of the gas occurs here and condensation of unfixed hydrocarbon vapors and water first takes place. The wash box is a seal to overcome the back pressure of the relief holder. By means of a circulating pump, water used in the wash box may be used over again if a hot well is available for catching the water from the separators. By using this water the loss of illuminants incident to the use of fresh water, would be less, and would result in economy in water and sewerage. From the wash box, the gas enters the scrubber, the function of which is to remove lamp black and tarry matter. In the wash box, the gas is forced through the water; in the scrubber, it is brought in contact with shavings, boards, coke or other material constantly wetted with fresh water or water from the hot well. In some plants no water is used in the scrubber. From the scrubber, the gas flows through a tubular condenser and more tar is removed here. After the gas enters the holder more tar is precipitated due to the cooling action of the water in the holder, and atmospheric temperatures. Purifying boxes and tar extractors also help the extractions of tar and other impurities.

The styles and quantity of apparatus varies in different gas works, but the principle involved is the same. Hydrocarbons of low boiling point and heavy oils are present in the gas, and it is the object of condensation to subject the gas to temperatures that will remove all heavy oils and leave in the gas as much of the light hydrocarbons as possible, and get as little of them as possible in solution in the tar. The tar should be removed as soon as possible from the gas, for it is useless as a source of light therein; it may cause stoppages in apparatus succeeding the condensing apparatus and because the tar absorbs illuminants. As the tar is carried further along, its temperature drops and the absorption increases.

To recover the tar flowing from the seal pots, and free it as nearly as possible from accompanying water, the best method for a small works is that proposed in the Catechism of Central Station Gas Engineering. The apparatus usually consists of an "oblong rectangular box of wood or iron about 4 feet wide, 5 feet deep and 16 feet long, buried in the ground deep enough to receive all wash box and drip water and to empty into a sewer or drain. This box is provided with a series of cross partitions at intervals of 18 inches or two feet; every other partition reaching from within, say 5 inches of the bottom of the box, to within 4 to 6 inches of the surface of the liquid in the box. Alternating with these partitions are others which reach from within 2 feet of the bottom of the box, to above the surface of the liquid, and called skimmers. The liquids to be separated are admitted at one end into the box (if possible from a height of several feet) falling on an iron plate and thence flowing through the separator. This striking of the tarry liquids on an iron plate helps to break up the vesicles of tar and water. The liquid flows—the slower the better—over and under the partitions, each reversal of current helping to precipitate the tar to the bottom; any light oils come to the top and are held by the skimmers until removed. The wider and deeper the box, the slower the motion of the fluid; the longer the box the more complete the separation. The higher the skimmers from the bottom of the box, the greater the capacity of the box to hold the separated tar between drawings off. The bottoms of the other partitions are only above the bottom of the box to enable accumulated tar to be drawn off at one end. The tar will never be completely drawn off, so that there is no danger of liquid flowing direct from one end of the box to the other under the partitions. The bottom of the skimmers should not be too high above the bottom of the box, however, or the zigzag reversals of current would be too slight. Keep the box covered with hatches and, if necessary, warm with steam pipes to keep the temperature about 150° F."

Instead of letting the water into a drain or sewer, it is best to collect it in the hot well and return it by a circulating pump to the wash box and scrubber. Exhaust steam should be used to keep the separator warm. A pitcher pump can be placed over the separator for sampling the tar collected, with dip pipes reaching different levels in the tar and water, and by their use the quantity of good tar in the separator may be ascertained. The separator does not free the tar entirely from water, but only partly refines it, the thoroughness depending upon the construction of the box and the time the tar remains in it. At Omaha the best tar drawn from the separator after 16 hours contained approximately 3 per cent. of water, a fair sample for this period containing about 6 per cent. More water may be separated by storing the tar in a condenser where the hot gases circulate around the tubes containing the tar. A tar may be obtained in this way containing as low as 1 per cent. of water. Another method would be to pump the tar direct from the separator into a tank connected in series to one or two others, and draw the tar from one tank to another. These tanks would act as separators. If, in the bottom of these tanks, or only one tank, coils were placed by which tar could be heated with exhaust steam, the process of refinement would be accelerated.

In plants where tar can be stored in the holder pit, the best plan would be to pump the tar direct from the separator or tar well to the holder. However, the question of storing tar in a masonry holder tank should be carefully studied, for tar may be lost by leakage, and then complaints of odors from sewers or polluting of wells, etc., will be received. Where only a tar well is available, the tar may be stored therein and undergo some separation before being removed. Where separators only are available for temporary storage, the best plan is to remove the tar periodically and store it in a condenser, or in tanks connected in series—or in one tank.

It is difficult to state the per cent. of water left in tars after definite periods of rest, because the quality of tars varies. Time required for separation generally varies directly with the specific gravity. A simple test to show the presence of water in tar, is to put a half teaspoonful on paper with a hard finish, and blow the tar into a thin film. The water will collect in drops. If the tar contains much lamp black, its presence can be shown by putting a few drops on absorbent paper. These rough tests, of course, only indicate certain characteristics of the tar, but after a little experience, they will convey a good idea of quality.

To determine the specific gravity, a hydrometer is used. This consists of a graduated stem, a bulb containg air, and a small bulb at the bottom, containing shot, which causes the instrument to float in the tar in an upright position. The specific gravity of refined water gas tar is usually between 1.04 and 1.08. With a 250 cc. distilling flask, a chemical thermometer, and a bunsen burner, the quantities of oils distilled off between certain temperatures may be compared

with figures obtained elsewhere, and a fair knowledge of your tar may be learned. Care must be exercised in performing this distillation, for tar containing water cannot be heated without some danger of foaming, and this action is attended with some degree of risk. Water is mechanically suspended in the tar, and when the liquid is heated sufficiently, the water is converted into steam, but due to the low vapor tension of the tar, it cannot be liberated instantaneously and pass out of the flask. The expansion of the steam lifts the tar to a higher level, and if the heat is not reduced in time, forces it out of the flask and into the glasses used to collect the distillates, spoiling the test. This action may be so sudden that the flask will break.

For the information of those interested in comparisons, a straight distillation test of refined tar made at Omaha is given below—

Fraction Number.	Temperature of Distillation.	Per Cent. by Volume.	Per Cent. by Weight.
1	200 to 250° F.	None	None
2	250 " 300° F.	1.0	0.60
3	300 " 350° F.	3.0	2.05
4	350 " 400° F.	7.0	4.64
5	400 " 450° F.	13.2	11.36
6	450 " 500° F.	16.0	14.13
7	500 " 550° F.	12.8	12.68
8	550 " 600° F.	9.0	7.88
9	600 " 650° F.	14.8	13.74
10	650 " 734° F.	....	14.94
Coke by weight.			15.98
		76.8	98.00

Specific Gravity at 60° F., 1.05.

This test shows the per cent. by volume off to 650° F., which is sufficient to show character of the tar. Distilled to coke, it shows a loss of 2 per cent., due to vapors escaping.

Nearly everyone knows that tar was once thrown away, and this lends cheapness to this product even at this day. At the beginning of the gas industry, tar was considered a disagreeable by-product which had to be removed at some expense. Gradually, through laboratory tests and experiments, knowledge of uses to which it might possibly be put was collected, and to-day products are manufactured from tar which have an important bearing upon sanitation, preservation of timber and building roadways. Tar is now a source of revenue—it has a commercial value.

A gas works may dispose of tar in four ways:

1. As fuel under boilers.
2. As fuel in generator.
3. Sell to tar distillers.
4. Sell locally.

As a boiler fuel tar is atomized in the fire box by a spray using steam or compressed air. The tar for this purpose, should be as free from water as possible. As the use of compressed air, or the injection of tar under high pressure, would involve considerable expense, steam as an atomizing agent is in most cases the best because of its simplicity.

Mr. W. N. Best says that tar as fuel has failed in most cases because attempts have been made to use a burner made of a piece of pipe mashed in a vise. As the tar and steam passed out of this pipe burner in the same direction, the fuel is not thoroughly atomized, resulting in loss of fuel and low boiler horse power. He says further: "Such a burner gives a round, funnel shaped blaze, causing an abrasive heat against the refractory lining of the fire box, wasting it away and endangering the boiler setting. They are not true burners, as they do not atomize the fuel and are simply blow pipes. Best practice is to use only one burner of such construction that it produces a fan shaped flame, filling the entire fire box with a sheet of flame."

Mr. Best gives two ways of installing a burner of this type:

"First: Remove the grates and construct with a few fire brick in the ash pit a checkerwork so that air for combustion is admitted in evenly distributed quantities to the fan shaped sheet of flame over the entire former grate area of the boiler. Second: In plants where the quantity of tar produced is not sufficient to run a boiler constantly, it should be burned over a bed of coal or breeze. In this case, the burner is piped with swing joints, so that when the supply is exhausted, the burner can be swung aside. While operating the burner a very poor quality of coal or breeze can be used.

"Globe valves or needle valves are useless for regulating tar, for when the supply is cut low they act like a strainer and soon the foreign matter in the fuel entirely shuts off the supply to the burner. To obviate this difficulty, everyone burning tar should use a regulating cock having a 'V' shape orifice in the plug, which not only has a shearing action on the heavy fuel, but also enables the operator to regulate the fuel supply to the minimum."

I quote from paper read by Mr. W. H. Taylor before this association in 1908, and published in the AMERICAN GAS LIGHT JOURNAL:

"The proceedings of the various associations and gas journals have covered this field very thoroughly, so that reference to them will furnish a considerable number of ways of furnishing burners for tar. Almost every works devises a burner to suit its local conditions, but all of them operate on the same principle—that of a small steam jet impinging on the tar and spraying it in the furnace. The features of a tar burner requiring attention are: Least quantity of steam used; elimination of small orifices and contractions that will easily plug up if some foreign substance gets into the tar; ease of cleaning during operation; and a sight feed."

Anyone interested in the disposition of tar in this manner should, before constructing burners of pipe or other material at hand, obtain as much information as possible from the proceedings and Journal above mentioned, or other sources, for these reasons:

The use of liquid fuel cannot be thoroughly mastered without careful investigation; majority of burners are not as efficient as they might be; liquid fuel is more delicate to handle than coal; use of too much steam effects evaporative efficiency of the tar, for the steam absorbs heat; the volume of gas yielded from tar is much greater than from coal, so that a greater volume of air is required for its complete combustion; the danger of localizing heat must be understood. These indicate the importance of collecting facts that will insure tar being used properly and efficiently. A small gas plant should be just as determined in getting the best results as the larger plants whose experimental work enables them to approximate ideal conditions. The results obtained by the larger plants are at the disposal of the small gas works for the asking.

It may be of interest to some to have a brief explanation of the advantage of steam in injecting the tar. (1) The effect of the steam is the mechanical one of atomizing and afterwards diluting the gas from the tar, simplifying the composition of the hydrocarbons, making a mixture comparatively easy to burn without formation of smoke, while the rich oil gas and tar vapors formed by the heating when no steam is there to aid the chemical inter-action are excessively difficult to burn without smoke. The tar is practically entirely converted into gas vapors and floating particles of finely divided carbon, before combustion begins, or at any rate before any large amount has been consumed, This requires a large combustion area as the volume of air needed to complete the action and prevent smoking is very great, while with coal, the combustion of the largest proportion of the fuel takes place on the furnace grate and it is only the escaping gases distilled out of the coal and formed by the incomplete combustion that have to be burned in the crown of the furnace and combustion chamber.

Coal fields in proximity to gas works determine the value of tar as boiler fuel. One gallon of tar is said to be equal in fuel value to 10 pounds of coal. Below are comparisons of tars from various sources:

Comparative Ultimate Composition of Coal, Coal Tar, Oil and Water Gas Tar.

	Coal.	Coal Tar.	Oil.	Water Gas Tar.
Carbon	82.47	89.21	84.28	92.70
Hydrogen	6.01	4.95	13.46	6.13
Oxygen	6.81	4.23	1.41	0.69
Nitrogen	1.88	1.05	0.24	0.11
Sulphur	2.83	0.56	trace	0.37
Heating value, B.T.U.	15,352	15,703	19,200	17,193

Comparative Distillation of Different Types of Tars.

	Horizontals	Coke Oven.	Verticals.	Water Gas Tar.
Sp. gr. at 25° C.	1.2039	1.1696	1.1302	1.0679
Free carbon cold CS_2	21.16	9.36	5.83	0.30
Distillation pr. ct. by wt.				
Start to 105° C.	0.4	1.0	0.1	1.1
105 to 170° C.	1.4	0.3	1.1	2.8
170 to 225° C.	10.8	10.0	13.9	9.0
225 to 270° C.	10.1	12.4	12.5	12.6
270 to 300° C	4.4	4.3	4.9	10.6
300 to 360° C.	4.6	3.1	1.5	7.9
Above 360° C.	20.4	28.0	27.3	30.4
Coke	46.5	40.6	35.5	35.4

Comparative Distillation of Three Types of Materials.

	Asphaltic Oil.		Water Gas Tar.		Coal Tar.	
Specific gravity	0.9177		1.1165		1.2090	
Free carbon	0.22		0.90		19.80	
Distillation.	Per Cent. Wt.	Grav.	Per Cent. Wt.	Grav.	Per Cent. Wt.	Grav.
Start 110° C.	0.32	.9105	0.29	0.9550	0.52	0.9862
110 to 170° C.	0.75	.8215	1.44	0.9637	3.06	1.0095
170 to 235° C.	6.25	.8436	14.61	0.9900	13.39	1.0146
235 to 270° C.	23.51	.9604	24.05	1.0188	12.78	1.0357
270 to 315° C.	48.00	.8782	15.73	1.0422	10.57	1.0785
Residue	20.27	1.1471	43.31	1.2310	58.92	1.2850

Comparison of Fuels.

	B. T. U.	Lbs. Per Gal.	B. T. U. Per Gal.
Pocahontas coal	15,391	....	.....
Bituminous (Pittsburg)	12,141	....	..
" (Illinois)	10,506	....	.....
Antracite	13,189	....	.....
Coke	13,000	....	.....
Beaumont crude petroleum.	19,000	7.5	142,500
Coal tar	16,260	10.0	162,600
Oil	16,970	9.5	161,200

Average Coal Analyses at Omaha, for Period of Three Months.

Kind of Coal	Moisture. Per cent.	Volatile. Per Cent.	Carbon. Per Cent.	Ash. Per Cent.	Sulphur Per Cent.	B. T. U.
Ills. lump	7.8	41.2	39.1	11.9	3.3	12,335
Ia. nut mixed	14.2	35.4	32.1	18.6	3 63	10,100
Cherokee Slack	4.2	32.5	43.7	19.5	4.60	11,337
Cherokee wash	6.1	34.9	39.8	9.4	3.91	12,717
Ia. mine run	15.0	32.2	31.6	21.2	5.73	9,253

For convenience, figures are given below showing heating value of coal, and pounds required to put them on same basis with 1 pound of water gas tar having 17,000 B. T. U. per pound.

Coal B. T. U. per Lb.	Pounds of coal Required Per Gal. W. G. Tar (9 lbs.)	Per Lb. Water Gas Tar
10,000	15.3	1.70
11,000	13.9	1.54
12,000	12.7	1.41
13,000	11.8	1.31
14,000	11.0	1.22

If we assume 65 per cent. efficiency for coal having average B. T. U. of 11,150 per pound, and 75 per cent. for water gas tar of 17,000 B. T. U per pound, then equivalent in coal of one pound of tar would be $\frac{17,000 \times 75 \text{ per cent.}}{11,150 \times 65 \text{ per cent.}} = 1.76$ pounds of coal.

For 9 pounds of tar (or one gallon) 15.84 pounds of coal would be required. The equivalent in tar of 10 pounds of coal would be 5.68 pounds.

Anyone can compute the value of their tar as boiler fuel by making a comparison such as above, although practical results would no doubt be at some variance with these calculations.

As a generator fuel, tar is pumped through a meter to top steam inlet of generator, on to the fire, where it is decomposed. A little water in the tar is not objectionable, and the tar is used only on down runs. In this way lamp black formed is caught by the coke and burned. If used on up runs, tar vapor would pass unburned into the carbureter and superheater and foul the brick.

In a paper by Mr. G. H. Waring, published in the AMERICAN GAS LIGHT JOURNAL of July 9th, 1906, he shows that 1 gallon of water gas tar is equal to 9 pounds of coke in the generator. If we assume 9 pounds as the weight of 1 gallon of water gas tar, then a pound of tar is equal in fuel value to a pound of coke. Tar used per thousand will vary from .3 to .5 gallon. Whether it is advisable to use tar as generator fuel depends upon its value compared with coke and coal, and prices obtainable through its sale. No doubt, in the majority of instances, the inconvenience of handling it, its probable effect on the checker brick, and the small saving effected, would give coke the preference except in cases of emergency. The passage of tar through the generator fire yields a gas of higher calorific power than blue water gas, and this gas has an enriching value, but the economies effected are difficult to state. The use of tar as generator fuel requires a deep investigation and collection of facts, as in the case of boiler fuel.

Tar distillers will buy good tar. An excessive amount of free carbon and water reduces its value, so it is important to make a good tar free from water. The yield of tar varies in different gas works and no doubt there are many where tar is used as boiler fuel and sold locally, so that there would be nothing to offer to tar distillers. Every plant should endeavor to create a market for its tar and not be dependent entirely on the distillers, although it is true that tar distillers have done more for the tar industry than the gas men. The tar distillers were, and are, an inevitable accompaniment to the gas business, and for a long time to come will handle most of the tar produced, but every gas plant should try to gradually create outlets through their own efforts.

In a small gas works refined tar only will be available for sale. In large works, where apparatus for manufacturing various products is installed, the work of introducing tar is easier, because of more outlets. A works can sell tar for dipping posts, telephone and telegraph poles, painting roofs, flumes, watering troughs, hay racks, wagons, steel tanks and buildings; also for roads for laying dust and killing weeds.

The following facts may be of interest: Some farmers paint posts in hog yards, where hogs can rub and free themselves from mange and lice. Rats will not knaw wood impregnated with tar. Tires do not become loose on wheels painted with tar. Trees have been trimmed and tar applied to the wounds with good results. Tar applied to water tanks will prevent scum from forming on the surface of the water. As a disinfectant for chicken houses, tar is as efficient as any article on the market. Two applications a year will keep chicken houses free from vermin of every kind.

No one should try to change the color of tar. The color is a drawback, but the user should consider the benefits and use it in its proper place. Tar cannot be colored successfully and retain its qualities. It may be applied in a number of ways. A flat brush is most commonly used. On large roofs sprinkling cans have been used in connection with large brushes, or it may be sprayed on buildings with a force pump. Water gas tar, when applied to wood or metal, dries hard and sticks. On metal it gives a glossy finish, which gradually becomes dull. At first the appearance of wood painted with tar is black. Gradually the color changes to a dark brown, and the visible effects seem to disappear. This change is due principally to the absence of free carbon, and because the tar penetrates the wood, leaving very little on the surface. Tar for metal surfaces should have a good body. Some refined tar may be a little thin for this work, but even so, it will be of much benefit in preserving the metal, though not so lasting as a heavier tar. There is no acid in water gas tar, therefore it will not corrode metal. If tar containing water is heated in a kettle, it is quite probable that a boil over will occur. If cold tar containing water is used for a paint, poor results follow, for the water prevents the absorption and adhesion of the tar. Tar sold should be as free from water as possible, so as not to invite claims for lack of purity, which are sure to be made if care is not used in refining it.

The advantage of a low carbon tar over a high carbon tar, whether used directly after being freed from water, or after being made into various products, are as follows: A low carbon tar has practically no free carbon to clog the pores of wood or stone; therefore, its waterproofing value is greater. Free carbon absorbs water; therefore, it is not an essential constituent but is detrimental. A low carbon tar will penetrate deeper into a substance. Free carbon itself has no binding strength. It retards the absorption of pure bitumen and oils. Specific gravity varies directly with the free carbon content. A tar with high specific gravity may contain a less quantity of pure bitumen and oils than one with a low gravity.

Local conditions would determine the course to be followed in marketing a tar for painting, preservative and road purposes. After the tar is refined and seems suitable for sale, the manager may consider the use of a small "ad." in a local paper, calling attention to its worth for these purposes. Practically all roofing paints are made from tar, and though they sometimes contain other ingredients, their real efficiency comes from the tar. This fact may be of some help in disposing of tar for metal and patent roofs. The tar can be boiled down in a kettle and become suitable for most roofing purposes, excepting gravel roofs, which require a heavier binder.

Most disinfectants are made from oils derived from tar.

Generally speaking, the value of refined water gas tar is underrated, and it is sold at less than its true value.

Refined tar is an excellent dust layer and weed destroyer, and through the local parties some tar might be disposed of for these purposes, as probably the business secured in this way would not warrant the purchase of a tank wagon, the best method would be to apply the

tar with sprinkling cans fitted with fan shaped nozzles having ¼-inch openings, the tar hauled to the job in barrels. However, if a tank wagon could be obtained, or if a drip wagon were available, a tar spreader could be made by bolting together two 2-inch flanges, having between them a circular piece of $\frac{1}{16}$-inch iron, extending on one side 2 inches beyond the edge of the flange, and a gasket of ¼-inch steel to extend half way round the flange. Such a spray would work best at a height of from 1½ to 2 feet above the ground. A hose could also be attached to the tank wagon and the tar applied through a fan shaped spray nozzle. The quantity of tar required for desirable results will vary according to the condition of the road. All foreign matter should be removed from the road. A light film of dust is not objectionable. Approximately one-half gallon per square yard would be required. It is best to keep traffic off the road for one day. Treatment of this kind is not permanent; traffic and drainage determine its efficiency. Tar is a good weed destroyer, and there may be other places besides roads where it could be used to advantage.

Refined water gas tar is used for making heavy road tars, pitches and creosote. Heavy tars for roads are made by distilling refined tar. The heat from the fire gradually raises the temperature of the tar, the light oils vaporize and pass out through a vapor line at the top of the still and on to the condensers, where they are condensed. As the temperature of the tar increases, heavier oils vaporize and pass out, and the tar gradually becomes denser, the consistency of the finished product depends on the quantity of oil distilled off. The consistency of road tar varies from that of thin molasses to soft pitch.

Heavy tars are used for constructing tar macadam roads; for resurfacing; for repairing; for laying dust and for building cinder walks and driveways. In selecting a compound for any of the above purposes, care must be taken to use tar suitable, and to see that it is applied properly. Road compounds are tested to determine their purity, binding strength, permanency and viscosity; and the results of these tests indicate what may be expected of the tar.

If we continue the distillation after the road tar has been made, we will produce a product of more weight, called pitch. This product is hard and lustrous after cooling, and is usually made into 3 grades, soft, moderately hard and hard. These grades are used for grouting brick, stone and creosote block pavements for roofing work in briquetting plants. Foundations of buildings, pipe, tanks and other things may be protected by coating with pitch. Varnishes are also made from pitch.

Water gas tar creosote is made by continuing the distillation after the road tar and pitch have been made. We fill the still with refined tar and apply heat, removing first the light oils and then the heavier series, passing the stage at which road tars and pitches are made, after which we derive the creosote fraction. In making creosote, the distillation is carried to a point where no oil is recovered; then the fire is drawn. The residue in the still is coke. Freshly made water gas tar creosote is red in transmitted and dark green in reflected light. It darkens with age.

It is used for impregnating telegraph and telephone poles, ties, cross arms, wood paving blocks, mine and bridge timbers; also for making shingle stains and disinfectants. The quality of timber in general use is deteriorating each year, due to the exhaustion of the better grades. Where practicable, the use of better woods, which are growing scarcer and more expensive, should be discontinued, and inferior ones, whose life has been prolonged by preservatives, should be substituted. Treatment with creosote decreases renewals of wood work and increases the species that may be drawn upon for consumption.

The principal requisites of a good creosote are, minimum content of low boiling oils, viscosity, and absence of free carbon. Water gas tar creosote fulfills these requirements; it is a first-class antiseptic and preservative. In making road tars, pitches or creosote, the fractions distilling off between the very light and heavy oils, comprise what are commonly called "dead" oils. Generally they are not considered valuable, but they may be used in the manufacture of disinfectants and shingle stains, and much is disposed of in this way. The oils distilling off under 392° F., when making the above products, are called solvent naphthas. Oil recovered from drip pots on gas lines, when distilling under 392°, are also classed as solvent naphthas. These naphthas are distilled and products such as naphtha, toluol, benzol, etc., are obtained, which are powerful solvents, and used for dissolving coloring matter, rubber and many other things. Paint manufacturers use large quantities in paints and varnishes.

THE new inclined retort plant of the Decatur (Ills.) Railway and Light Company is now in operation, four of the six new benches having been started up. The installation is of Gas Machinery Company's silico retorts and settings.

Corrosion of Metals.

In a paper on the "Corrosion of Metals and Alloys in Contact," in the *Engineering Record*, R. H. Gaines, chemist, Board of Water Supply, New York city, gives these results:

During the past 2 years experiments have been in progress at the laboratory of the New York Board of Water Supply to determine the loss suffered from corrosion by steel and other metals when in contact under different conditions, and incidentally to observe some of the phenomena of galvanic action.

Corrosion in Concrete.—In the first series of experiments specimens of the metals in Table 1 were weighed and embedded singly and in contact in damp concrete and allowed to remain 2 months. At the end of the period the concrete blocks were broken and the metals taken out, carefully cleaned, dried and re-weighed, the loss in weight representing the amount of corrosive action.

TABLE 1.—*Corrosion in Concrete.—Single Metals.*

Metals.	Jan. 2. 1912.	Mar. 4. 1912.	Grams Loss, 2 Mo.	Loss in Grams, per Sq. Ft.
Manganese bronze	73.6655	73.6475	0.0180	0.32
Steel	39.1556	39.1481	0.0075	0.135
Lead	92.3806	91.7146	0.6660	11.99
Copper	73.7630	73.7272	0.0358	0.64
Monel metal	62.9667	62.9646	0.0021	0.04
Metals in Contact.				
1 — Steel	37.0380	37.0270	0.0110	0.20
1 — Manganese bronze	70.6864	70.6700	0.0164	0.30
2.— Steel	38.1746	38.1700	0.0046	0.08
2.— Lead	90.0399	89.5408	0 4991	9.08
3.— Steel	38.8055	38.8031	0.0014	0.03
3.— Copper	70.1913	70.1348	0.0565	1.04
4.— Steel	38.6396	38.6271	0.0125	0.23
4.— Monel metal	60.1092	60.1074	0.0018	0.30
5.— Steel	34.5626	34.4626	0.0999	2.48
5.— Lead	83.8586	83.5163	0.3433	6.77
5.— Copper	68.9752	68.9626	0.0126	0.31
6.— Steel	34.7072	34.8026	0.0676	1.68
6.— Fiber.	....	.....	....	...
6.— Copper	64.1247	64.1122	0.0125	0.31

The resulting losses show but slight differences when in contact and alone, and, therefore, give no positive evidence of electrolytic action when the metals are coupled in concrete. With the exception of the lead the loss was negligible, that of the Monel metal almost nil. The corrosive action in the lead is purely solvent in character, due to the alkali, and no surface coating is formed to hinder progressive deterioration.

Corrosion in Water.—After the first series of tests was completed the same specimens, singly and in contact, were placed in jars freshly filled with Croton water. The jars were then sealed and put on a shelf in the laboratory for about 19 months. At the end of this period the specimens were taken out and carefully cleaned, dried and re-weighed. The losses are given in Table 2.

TABLE 2.—*Corrosion in Water.—Single Metals.*

	Mar. 4, 1912.	Oct. 3, 1913.	Loss or Gain. Grams, 19 Mo.	Loss, Grams, per Sq. Ft.
Manganese bronze	73.6475	73.7971	+0.0496	....
Steel	39.1481	36.9767	—2.1714	39.08
Lead	91.7146	91.7591	+0,0445	....
Copper	73 7272	73.7254	—0 0018	0.032
Monel metal.	62.9646	62.9554	—0.0092	0.17
Metals in Contact.				
1 — Steel	37.0270	35.7425	—1.2845	23.12
1 — Manganese bronze	70.6700	70.6822	+0.0122	....
2.— Steel	38.1700	36.9922	—1.1778	21.20
2.— Lead	89.5408	89.3314	—0.2094	3.77
3.— Steel	38.8031	37.6435	—1.1596	20.87
3.— Copper	70.1348	70.1522	+0.0174	....
4.— Steel	38.6271	37.7372	—0.8899	16.02
4.— Monel metal	60.1074	60.1108	+0.0034	....
5.— Steel	34.4629	33.2073	—1.2553	22.59
5.— Lead	83.5163	83.4896	—0.0267	0.48
5.— Copper	68.9626	68.9684	+0.0058	....
6.— Steel	34.8026	34.4543	—0.3483	6.27
6.— Fiber.	.....	.....	.....	....
6.— Copper	64.1122	64.1047	—0.0075	0.14

In each of the experiments (*i. e.*, in damp concrete and in Croton water) specimens numbered 1, 2, 3 and 4 were in absolute metallic contact, flatly bolted together by iron screws and nuts. Specimen 5 consisted of three metals flatly bolted together, but the connecting bolts were insulated from the plates by fiber collars and washers. Specimen 6 was made up of two metals separated from galvanic contact by a fiber plate, and held together by bolts which were also insulated from the plates by fiber collars and washers.

The evidence from the experiments apparently indicates, however, that contact between steel and bronze, and steel and the other metals of the series, neither promotes nor accelerates the corrosion that normally takes place in steel alone. By its very lack of homogeneity in composition and structure the average steel surface in water as it occurs in nature presents all the conditions necessary for active electro-chemical corrosion. What the writer once termed auto-electrolysis is the inevitable outcome, and this process in steel does not appear to be hastened by contact with other metals or alloys. In fact, the legitimate conclusion is that rather less than more galvanic action arises from contact between steel and the other metals of the series than from contact between steel and steel. In actual practice it has been found that if a steel nut is put on a steel bolt and subjected to corrosive conditions, in a comparatively short time the steel nut will have to be hammered or split off, if gotten off at all, on account of rusting from local corrosive action; whereas, a brass or bronze nut on a steel bolt under similar conditions can be readily screwed off. This is a very important consideration where quick changes in water works machinery or installation must be made from time to time.

New Methods and Appliances.

BY-PRODUCTS OF THE MANTLE INDUSTRY.—Lighting mantles are composed of 97 to 99 per cent. of thorium oxide, 0.8 to 2.8 of cerium oxide, and a few tenths of a per cent. of beryllium and aluminium oxides, the higher proportion of ceria being used for mantles for high pressure gas. The traces of the other oxides mentioned impart strength by producing a partial sintering of the deposit. The ash content of the textile yarn must be very low—not more than 0.02 to 0.03 per cent. 300 tons of thorium nitrate are consumed yearly in the mantle industry, representing about 3,300 tons of monazite sand. The by-products include over 1,000 tons of cerium oxide, 3 tons only of which are required for mantle making. A ton of sand, costing $150, contains 2.5 milligrams of radio-active mesothorium, of which two milligrams worth $150 are recoverable. Thus 6 grammes of mesothorium are available as a by-product, but much larger quantities will probably be required for therapeutic purposes. Since the mantle industry cannot absorb more thorium, the extraction of larger quantities of mesothorium depends on the profitable utilization of cerium. Of the 1,000 tons of cerium oxide now obtained, 200 tons are employed in the manufacture of sparking alloys for friction lighters, and is obtained by electrolysis of the fused chloride. 300 tons more are used in the form of the fluoride for impregnating arc-light carbons. A considerable outlet for cerium compounds might be found in the weighting of silk. The dyeing and photographic industries take small quantities of cerium salts. In commercial mesothorium, 25 per cent. of the radio-activity is due to radium which cannot be separated. Weight for weight, mesothorium is 300 times more active than radium, but it breaks down in a much shorter time. One of its most useful products is thorium-*x*, which is 200,000 times more active than radium, and can be obtained in the form of solutions of any desired strength.

SMOKE PREVENTION BY STEAM JETS.—According to observations recorded by the late Lord Armstrong, steam issuing from an orifice in a boiler is electro-positively charged. Use of this principle for the dispersion of smoke has been the subject of experiments by Mr. G. B. Burnside, of the University of Glascow, Scotland, In the course of this work aqueous vapor was projected from nozzles placed in the center of the chimney. The steam, in its passage through the nozzles, was electrified by friction and also partially condensed. In this way a cloud of aqueous vapor, electrically charged, was obtained in the chimney. The particles of aqueous vapor acted as a center of attraction, around which the soot particles congregated and formed groups, which fell down the chimney by gravity. In an experiment with a large school chimney, 220 pounds of soot was collected in one month.

Items of Interest
FROM VARIOUS LOCALITIES.

THE Ontario (Canada) Railway Commission has given judgment in the application of the Montreal Light, Heat and Power Company for authority to lay a 30-inch gas pipe from the company's new works on the Lachine Canal across Grand Trunk Railway property. The application is granted, the public necessity of the work, which will supply gas to a large number of Montrealers, being recognized. It is provided, however, that the work must be carried out to the satisfaction of the railway and without interfering with the railway companies' operations. The gas company must be responsible for any damage caused to railway property.

THE Gas Machinery Company, of Cleveland, O., is under contract with the High Pressure Construction & Supply Company, of Millville, N. J., to install a 6 foot water gas apparatus at the plant of the Millville Gas Light Company. The contract also includes an operating floor and reverse steam connections for the present 6-foot set which was furnished by The Gas Machinery Company in 1911. The new apparatus will be ready for operation in August.

MR. WILLIAM C. ANDERSON, former Manager of the Luzerne County Gas and Electric Company, Pa., is engaged in the sale of investment securities, having recently associated himself with Mr. Edward C. Batchelor, representative of Bertron, Griscom & Company. Mr. Anderson's long experience in building up and operating utility companies should make him an efficient advisor to those investing in securities of such companies.

CIRCULARS calling on "all civic, political, religious, fraternal, benevolent and social organizations in the Second Ward of the Borough of Queens, New York City," to come forward and give their "financial and moral support" to a fight started against an increase in the price of gas from 95 cents to $1 a thousand cubic feet and demanding instead a reduction to 80 cents, are being distributed. Following the fight of a year ago, the Newtown Gas Company reduced its price to 95 cents a thousand for one year. This agreement has expired and the company gave notice that the rate would be increased to $1. It is estimated they have about 30,000 consumers in the second ward, and it was said at mass meetings held last week that the company lost $75,000 by the 5 cent reduction of last year. The announcement of the price increase resulted in the organization of the Gas Consumers' Protest League of the Second Ward, with more than 35 civic and political organizations joining. Those in charge of the fight say the Newtown Gas Company buys its gas from the Brooklyn Union Gas Company for 50 cents a thousand and it is piped from Brooklyn into Queens. While people living on the side of a street, which is in Brooklyn, may be paying only 80 cents for their gas, people living on the opposite side of the street, in Queens, object to being charged $1 for the same gas.

"G. M. N," WRITING from Bath, N. Y., says Superintendent Frank Nollett, of the Bath Electric and Gas Light Company, besides increasing the company's business, is helping to boom Bath by the high-class booklets and other printed matter that he issues from time to time. The latest is an 8 page folder boosting gas for lighting, heating and cooking, showing the best things in new appliances, describing the company's plant and its facilities, and listing a few of the advantages of the town as a place of residence and a manufacturing centre.

A COMMITTEE of citizens in Bellmore, L. I., has begun an inquiry into the matter of gas lighting in that village for the purpose of ascertaining the reason for the delay in making installations. Its members will confer with the Nassau and Suffolk Lighting Company's officials and, if the matter is not satisfactorily adjusted, it is understood that steps will be taken at once to force the issue. The tax bills include a charge for street lights, but none have yet been put in service.

GENERAL MANAGER BARNES, of the Winston-Salem (N. C.) Gas Company, has entirely reorganized his forces. Mr. J. B. Smith, formerly of Hannibal, Mo., has charges of the commercial department; J. A. Hill is superintendent of manufacture; Chas. Nelson, superintendent of distribution; T. Heath is street forman; and Miss Lelia Dean has charge of the office.

THE Southern Gas Company has been organized in Birmington, Ala., with a capitalization of $300,000, of which sum $200,000 has been paid in and articles of incorporation filed. The Directors of the Company include C. H. Scott, W. H. Harrison, Jr., Louis Pitzitz, John R. Cochran, John M. Corr. Charles H. Scott is President and Treasures; John M. Corr, Vice-Prasident, and W. H. Harrison, Jr., Secretary and General Manager. Announcement is made that the Company will erect a number of gas works throughout the South, the first one having been started already at Waycross, Ga.

A CORRESPONDENT in Baltimore, Md., writes us that the Consolidated Gas, Electric Light and Power Company has begun preparations for laying a 36-inch main in the bed of Light street, from Lee to German street, this being part of the Company's new distribution system, which will extend from the Spring Garden plant to German and Calvert streets, and will cost more than $100,000. This is only part of the work that is being done by the Consolidated at this time. Geo. Beadenkop, Superintendent of Construction, has large forces of men at work in all parts of the city, laying mains in advance of new street paving, the great amount of new street work being done by the city having put a heavy burden on the gas company.

A $500,000 gas plant, to supply Boulder and other northern Colorado towns with gas, will be built in Boulder, if the town council grants an extension of the franchise of the Federal Gas Company from 17 years to 25. The men back of the movement are J. T. Bacon, F. D. Russell and Warren De Long, formerly of Philadelphia, but now of Denver, who have options upon the plant of the Federal Gas Company in Boulder and a number of plants located in other northern Colorado towns.

THE Orange County Lighting Company, Middletown, N. Y., has about completed plans for the erection of a new plant between the Erie and O. & W. tracks, on Genung street. Work will be commenced within a short time and rushed to completion. The new plant location will give excellent shipping facilities. With the present location, on Canal street, the hauling of coal is a great item of expense. Gas will be piped through Genung street and South street in a 10-inch main to the center of the city distribution system. The new main will be laid by a force of men under Mr. T. W. Davey.

THE Peru (Ind.) gas rate controversy will probably be adjusted in the near future. The city council has been holding out for dollar gas, but the Citizens Lighting Company of La Salle and Peru, claim they cannot make a flat rate of that price. They have suggested a sliding scale, ranging from $1.15 per thousand cubic feet down to 95 cents, the first 5,000 cubic feet to be at the rate of $1.15, so that the ordinary consumer would get this price.

UNITED STATES DISTRICT COURT JUDGE C. W. SESSIONS, has made an order providing for the sale of the plant of the Dowagiac Gas Company, of Dowagiac, Mich., to satisfy the claim of the first mortgage of about $42,000, being $34,000 bonds and the interest accumulated during a term of years. The sale will be held August 28, and will be confirmed August 29 by the federal court. The property is said to be worth from $45,000 to $55,000, and the court will insist on a fair figure for the property. Intervening bondholders, who tried to prevent the sale, and second mortgage holders, will get no satisfaction until after the first mortgage holders are satisfied.

L. R. EAKIN, of the Eakin-Donelan Company of Manhattan, Kan., is in Hibbing, Minn., looking over the field with a view of interesting the council in the installation of a gas plant. Under the plan that is proposed, Hibbing could either own its own plant, in which case Mr. Eakin and his associates would construct and operate it for one year as a test; or a franchise could be granted to the firm and the plant will be installed without cost to the municipality. Hibbing is a flourishing town in the mining and lumbering district, some 80 miles north-west from Duluth.

THE Wilmington, Del., Gas Company, owners of the New Castle Gas Light Company, will close the plant in the latter city, after half a century of operation. A plot of ground has been secured and a large storage holder will be erected to contain the gas piped from Wilmington.

THE Central Indiana Gas Company, Anderson, Ind., has reported to the police that a vicious dog has hindered their men from reading the meter of the Hy Malone home, 1813 Brown street. The gas company men state that one representative was held a prisoner in the basement of the Malone home for half a day by the dog. The gas company has been promised the aid of the police, and Chief Mountain says that the gas company may turn off the gas if the dog isn't muzzled or properly penned up.

MR. CHARLES H. PRINTZ, favorably known to the gas fraternity for a number of years as a sales engineer for prominent constructing companies, has been elected a vice-president of the Gas Machinery Company of Cleveland, O. Mr. Printz will reside in Cleveland. Both he and the Gas Machinery Company are to be congratulated.

E. S. HINMAN, Carl D. Jackson and Mrs. Helen M. Sweet, of Oshkosh, Wis, have incorporated the reorganized Antigo Gas Company, under the name, City Gas Company, of Antigo, Wis. But in taking such actlon, the three merely did so to comply with the law, which requires that public utilities shall be owned and operated by a corporation of the State of Wisconsin. They do not hold any stock, nor are they required to do so. The Antigo Gas Company went into the hands of a receiver about a year age, under the foreclosure of first and second mortgage bonds, and on May 6th it was sold at auction and purchased by the trustees, Louis Schriber and R. H. Hackett, who were in power through a deed of trust. The plant was purchased for the bondholders, and in the reorganization the incorporators are given power to turn the plant over to the bondholders. However, as these bondholders are residents of different states, they could not themselves properly form the corporation, but the stock and bonds will be issued to them when the organization is perfected.

THE Hagerstown (Md.) Light and Heat Company has filed with the Public Service Commission, its tariff for gas consumed after June 1, 1914. The following are the rates: For the first 1,000 cubic feet, $1.25; for the next, $1.15; for the next, $1.05; for the next 2,000 feet, 95c. Containing the sliding scale, for over 300,000 feet the charge would be 60 cents a thousand.

THE Philadelphia (Pa.) Bureau of Gas is installing a 4,500 candle power high-pressure gas lamp in the court yard of the City Hall. Chief Dickerman, of the Bureau, says the new lamp will cut in half the cost of light where substituted for electricity. "I am putting this lamp in the court yard for experimental purposes," said Mr. Dickerman. "London, Berlin and Paris have operated it for 3 or 4 years and the lamp is an established success. Lighting engineers of Berlin and London are now in this country endeavoring to awaken American light consumers to the value of it, just as they brought over the tungsten lamp and developed it for American manufacturers. The new gas lamp is proving a success and the system of providing the pressure is simple and inexpensive."

FOLLOWING its purchase by the Southern Gas and Electric Corporation of Baltimore, Md., the Gas Light Company of Augusta, Ga., is making extensive expenditures and changes, including the appointment of Mr. J. J. Humphreys as General Manager, and Mr. Isaac McGraw as New Business Manager. Many main extensions will be made, the local office will be modernized, and an aggressive campaign started for new consumers. They expect to place 2,000 gas ranges this year.

Recent Patent Issues.

Prepared for the AMERICAN GAS LIGHT JOURNAL by ROYAL E. BURNHAM, solicitor of patents and counselor in patent causes, 833 Bond Building, Washington, D. C., from whom illustrations and specifications of any patent mentioned below may be obtained for 20 cents.

1,096,276. Gas Igniter. H. B. Steele, Boston, Mass.

1,096,277. Gas Controlling and Lighting Mechanism. H. B. Steele, Boston, Mass.

1,096,389. Gas Burner. B. A. Eeurink, East Cleveland, O., assignor to The Trenkamp Stove & Manufacturing Co., Cleveland, O.

1,096,714. Attachment for Gas Meters. J. G. Hayden, New Lexington, O., assignor of one-half to R. B. Elliott, Roseville, O.

1,096,774. Gas Producer. C. Whitfield, Sydenham, London, England.

Utilities Commission News.

BUCYRUS (O.) RATE VALUATION.—The decision of the Public Utilities Commission of Ohio in the case in which the Bucyrus Light and Power Company appealed from the action of the Bucyrus City Council has been announced. A number of the principles for which the company contended were recognized by the commission, though some of the values were reduced. For the items of intangible value the commission allowed $14,000, or about 19 per cent. of the value of tangible property, omitting real estate. The company claimed $54,860 for the intangible value, the amount being found by taking certain percentages of a claimed reproductive value of $122,268. The commission pointed out that depreciation had not been taken into consideration by the company in the intangible values, as it had on the value of the tangible property. The items considered under this head are cost of engineering, superintendence, insurance, taxes, legal expenses, interest during construction, financing and development. While the commission recognized the item of financing and development under this head, its opinion of the amount differed widely from that of the company. In arriving at the valuation of the property the commission took an average of the appraisals made by the different experts. The reproduction cost was found and from this the depreciation was deducted to obtain the present value of the physical property. For the amount of depreciation the commission followed the figures of its own representative rather than those of either the company or the city, taking total depreciation at $20,674. The value of the physical property was placed at $81,000, and to this was added the $14,000 intangible value, making $95,000 to be considered for rate-making purposes.

ASKS ILLINOIS COMMISSION TO INCREASE MINIMUM.—The Logan County (Ills.) Gas Company has not asked the State's Utilities Commission for an increase in rates. A case has been filed with that body asking that the company be permitted to change its minimum charge, and the case will be considered June 19 when the other two utility rate inquiries are called. Last December this company changed its minimum from 25 to 50 cents, and it is this minimum that they desire to maintain.

ATLANTA (GA.) TO PETITION.—Having been successful in securing the signatures of about 1,500 registered voters to a petition asking for cheaper gas in Atlanta, City Electrician R. C. Turner will take the question before council at its next regular meeting. The petition asks that the council appropriate $5,000, to be used by the Georgia Railroad Commission to determine whether the prices charged for gas in Atlanta are fair or unreasonable.

CONNERSVILLE (IND.) WANTS ARTIFICIAL GAS AT SAME PRICE.—A petition has been filed with the Indiana Public Service Commission, asking that the People's Service Company be not allowed to increase its rates for gas in Connersville on June 1, as announced. The move will bring the case to the commission's attention, and will result in its considering the matter of the local corporation's raise in rates as, indeed, the commission would be expected to do in any event. The present rates for gas are 50 cents per 1,000 cubic feet, with a minimum charge of 50 cents per month. The change proposed, which is coincident with the announced change to all-artificial gas, would make the rates $1 per 1,000 feet, with a minimum monthly charge of 75 cents.

KINGSTON, N. Y., COMPLAINT WITHDRAWN.—Mayor Canfield, of Kingston, N. Y., has withdrawn the petition and complaint filed by him with the Public Service Commission against the Kingston Gas and Electric Company, as the Company has revised and materially reduced its rates. The complaint filed on March 5th, last, asked for an investigation of the rates charged by the company for gas and electricity; of the quality and pressure of both; of the minimum charge, and of the charge made against the city for public lighting, and for a general investigation of the Company. The minimum charge of 50 cents per month has been eliminated and instead thereof there will be a minimum charge of $6 per year. The Company will test its gas every day, and the Commission will have it tested 16 times per year, insuring good quality.

FIGHTING THE ILLINOIS COMMISSION.—While several suits testing the constitutionality of the Public Utility Commission act are pending in the courts, Mayor Harrison proposes to proceed with the regulation of Chicago utilities until he clashes with the commission and then make a finish fight for home rule in Chicago.

Financial Notes.

THE commercial showing of the subsidiaries of the American Public Utilities Company, in 12 cities, for the week of May 16, 1914, when compared with a similar period of 1913, is remarkably satisfactory. The output of gas and electric current shows increases ranging from 5 to 40 per cent. The increase in the amount of gas used was to be expected from the growth of the communities in which the companies are located. The increase of electric current marketed is more significant and important, as showing an encouraging tendency toward the restoration of industrial activity, and is an indication of healthy growth in industrial circles.

PACIFIC GAS AND ELECTRIC earnings for the first quarter of 1914 established a high record, and by a reduction of operating costs, the company largely increased its net earnings over those for the first quarter of 1913. Included in operating expenses are maintenance and depreciation charges and, while these are not segregated, it is stated by interests associated with the company that they are running at the rate of $700,000 a year.

IT is understood that the earnings of the People's Gas Light and Coke Company of Chicago are showing a comfortable margin of over the 8 per cent. dividend rate. The increase in sales of gas this year over last has been normal.

THE committee on stock listing of the New York stock exchange has directed that all transactions in People's Gas Light and Coke Company subscription receipts for capital stock be third installment 75 per cent. paid.

THE shares of the Consolidated Gas, Electric Light and Power Company of Baltimore, Md., had a sharp upturn in the late session of the exchange. The common sold up to 108 and the preferred to 113. The advance in the first named was most marked, although the demand for both showed some eagerness on the part of the buyers. The improvement was again attributed to the rumors that the company may soon reopen its policy of retiring the preferred by having it converted into the common. In order to do this effectively the common must first be made to sell at or above 120, as the preferred has a redemption clause at this figure. Until it is retired it stands as a lien on the property.

BY selling at 84¼, Massachusetts Gas common touched the lowest point since 1910, when the annual dividends on the stock were 3 per cent., compared with 5 per cent. at present. The current weakness is due largely to the uncertainty which exists over the maintenance of the present disbursement. With 6 weeks of the present fiscal year to run, indications are that the year's earnings will show the 5 per cent. common dividend barely earned.

THE Standard Gas and Electric Company has deposited $51,500 in sinking fund account with the Philadelphia Trust, Safe Deposit and Insurance Company, of Philadelphia, to purchase bonds of the Company in accordance with the terms of the trust deed. The Company has declared the regular quarterly dividend of 2 per cent. on the preferred stock, payable June 15, to holders of record May 29.

THERE is strong demand for stock of the Wisconsin Edison Company, which is one of the leading subsidiaries of the North American Company. The Wisconsin Edison has $1,000,000 6 per cent. preferred shares and 200,000 shares of common stock outstanding. A peculiarity of the common stock is that it has no stated par value. In this week's inquiries for the shares, prices ranged from 43 to 43¼. The stock is being traded in a "when and as issued." The Wisconsin Edison Company controls through stock ownership the Milwaukee Electric Railway and Light Company, the Milwaukee Light, Heat and Traction Company, the Wisconsin Gas and Electric Company, and Watertown Gas and Electric Company.

THE proposed Consolidated (N. Y.) Gas convertible debentures carry 6 per cent. interest and will be convertible into stock at par after 3 years from date of issue. The present market for the rights indicates that the bonds are valued at about 115, at which price the yield to the investor who buys for the 3 years before conversion would approximate 5.12 per cent. The issue of $25,000,000 of these obligations by a company with such large earnings and moderate dividend requirements as in this case is for the purpose of retiring the floating debt of about $12,500,000 and to strengthen the current assets by the addition of a like amount of cash. The Consolidated Gas Company has been maintaining its dividend payments of 6 per cent. out of earnings of between 14 and 17 per cent., which explains its ability to make the large expenditures for improvements and additions to plant that have been features of the recent years.